CALIFORNIA
OIL WORLD
and Petroleum Industry

PUBLISHED TWICE A MONTH — ENGINEERING — TECHNOLOGY — LATEST NEWS

SECOND ISSUE
DECEMBER 1941
VOL. 34 NO. 24
WHOLE NO. 1599

IN THIS ISSUE

California Petroleum Industry Organized for War 3

California Oil & Gas Association Election 4

Los Angeles Basin Development 5

Characteristics of California Crude Oils 9

San Joaquin Valley Development 26

Coastal District Development 29

Laugh This Off 30

Business Directory 32

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California Oil World and Petroleum Industry is published twice a month at 1009 in the 939 So. Broadway Bldg., Los Angeles, California. Entered as Second-class Matter January 1, 1937, at the post office at Los Angeles, California, under the Act of March 3, 1879. Subscription price $1 per year in U. S. and Possessions, $2 in foreign countries, including Canada. Member of the Audit Bureau of Circulations.

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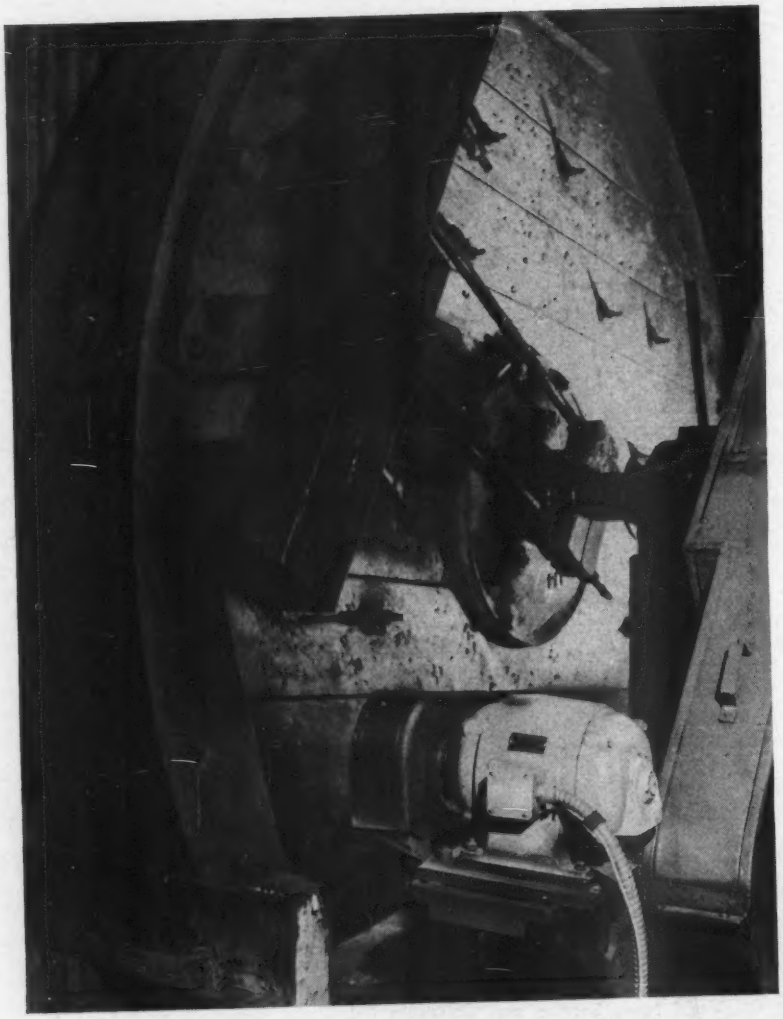

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California Petroleum Industry Organizes

To Assure Maximum War Effort

In order "to assure the proper development, production, and utilization of the reserves of petroleum and natural gas in District No. 5 (California); to make petroleum and petroleum products available at the proper places to meet military and civilian needs; to accomplish the most effective use of critical materials; to assure the efficient use of transportation, storage and refining facilities; to eliminate the drilling of unnecessary wells; to prevent physical waste above and under ground; and to assure that natural gas produced in conjunction with petroleum is used primarily for the efficient recovery of petroleum," Recommendation No. 19 of the Petroleum Coordinator for National Defense—the production plan for the California oil industry—will be put into effect immediately, E. E. Pyles, chairman of the Production Committee for District No. 5, which formulated the plan, said in presenting it to a mass meeting of the oil industry at the Biltmore Hotel Ballroom in an all day session Dec. 16. Its approval by the Petroleum Coordinator and the Department of Justice was announced Dec. 12.

In substance, the plan requires the Production Committee for District No. 5 to supervise the development and production of oil in California with due regard for efficient methods so that oil reserves and critical materials are conserved. The amount of production is to be based upon the requirements set by the Office of Petroleum Coordinator, but the committee is expected to encourage development of new reserves. Pending further developments, the present staff of the Conservation Committee of California Oil Producers is expected to handle all details of the program, having been nominated to do so by Mr. Pyles and the proposal having been accepted by the Petroleum Coordinator.

The plan is expected to be effectuated in cases where cooperation of producers may not be forthcoming by the policy of discouraging the handling by transporters, refiners, or marketers, of oil produced contrary to its provisions.

The industry's position in the war effort, as well as the effect of the production plan on the other branches of the industry, were also fully discussed at the meeting, at which more than a thousand oil men and others interested were present. A. L. Weil, chairman of the General Committee; W. L. Stewart, chairman of the Refining Committee; C. S. Jones, chairman of the Transporation Committee; C. S. Beesemyer, chairman of the marketing Committee; Wm. Moeller, Jr., chairman of the Natural Gas and Natural Gasoline Comittee, all spoke briefly on the plan and its relationship to the branches of the industry with which they are primarily concerned.

> While the recently adopted plan for conduct of the California petroleum industry during the war emergency is of considerable interest, California Oil World is reserving extended discussion of the plan until the First Issue, January, 1942, when data on allowables, and developments in the operation of the plan should be available for a more thorough presentation.

The plan itself establishes principles of production practice in California by which the industry is expected to govern its production activities during the emergency. It covers the formulation of field development plans, drilling programs, and fixing of production quotas; giving consideration to good engineering practice and the need for conservation not only of oil but also of critical materials, according to Mr. Pyles, except where special requirements make it necessary for the Coordinator to require greater production for a given type of oil. In addition, the plan prohibits the arbitrary transfer of allowables, which has been a troublesome question in the California oil industry for many years past.

Approval of the Department of Justice has been secured from Assistant Attorney General Thurman Arnold, who has advised J. Howard Marshall, Chief Counsel for the Petroleum Coordinator that

> "The Department of Justice will not institute criminal or civil proceedings against members of the oil industry for acts committed in good faith within the limits of the plan set forth in the Recommendation. The Department of Justice, however, reserves the right to examine the actual operation of the plan and proposes to exercise this right from time to time. If this examination discloses at any time that the plan in fact operates to restrain trade in violation of the antitrust laws, the Department reserves complete freedom to institute civil proceedings to enjoin the continuing of acts or practices carried on under the plan and persisted in after notice to desist."

Starting with the development of newly discovered fields and pools, the plan requires the production committee for the district "with the assistance of the owners and operators" of such fields and pools to prepare plans for their orderly development, "including proper well-spacing practices and the consummation of unit or cooperative agreements for development, pressure maintenance, or repressuring, designed to effectuate the maximum practicable recovery within a mini-

mum expenditure of critical materials."

As to proven fields, the plan requires the production committee for the district to "study and report to the Office of Petroleum Coordinator the necessity for any new well or wells in a proven field or pool, taking into consideration the relation of such well or wells to the most efficient operation of the field or pool as a whole, the availability of critical materials, and other pertinent factors. If the Production Committee finds that any proven field or pool should be developed further in order to accomplish the objectives of the Recommendation, it shall cooperate with the owners and operators thereof, and others having an interest therein, in devising a plan to effect this development with a minimum expenditure of critical materials."

Later paragraphs of the plan set forth the principles by which it is proposed to conserve oil reserves and produce them efficiently, not only with respect to the reserves themselves, but also with respect to the efficient use of critical materials. In order to effect these objectives, and in addition prevent accumulation of above ground storage, "the Production Committee shall prepare a plan, which shall be reviewed from time to time by said Committee and appropriate revisions made, for the equitable allocation of petroleum production among the various fields, pools and wells in District No. 5."

The plan then lists the factors that shall be considered in arriving at allocation schedules as "gas-oil ratios; water production; regularity of water encroachment; maintenance of reservoir pressures; regularity of pressure pattern throughout the reservoir; other factors bearing upon the efficiency of production operations under recognized engineering practices and the principles of conservation; such other factors as may have a bearing on the problem of obtaining the maximum practicable ultimate recovery of petroleum and natural gas from each field and pool."

The production committee for the district is then charged with the responsibility of determining the maximum rate "at which petroleum can be produced from the several fields, pools, and wells, in compliance with recognized engineering practices and principles of conservation, which maximum rate shall be redetermined from time to time."

When the Committee has determined the maximum efficient production rate and has been informed by the Coordinator of the current requirements for petroleum and natural gas, "then, if such requirements are less than the amount that can be produced without waste underground, the Committee shall, in order to avoid waste above ground, calculate appropriate rates of production for the various fields, pools and wells, without unreasonable discrimination in favor of any one field, pool or well as against any other field, pool or well in District 5, to meet the estimated requirements." In such calculations, the following factors, in addition to those previously mentioned, shall be considered: the kind and quality of petroleum produced in the various fields, pools or wells in relation to current requirements; the availability of transportation; the effect of reducing rates of production on the continuity of production from any field, pool or well; maximum production for large wells and minimum production for small wells.

The Recommendation provides for appeal and review of any provision or plan issued under it, with the requirement that pending such a review, the complaining party is to abide by the plan in question. Review is taken to the Office of Petroleum Coordinator for National Defense, the whole plan being based upon the importance of maintaining adequate oil production in California, particularly in view of the present war effort of the nation, and on the fact that there is no oil available on the Pacific Coast except that produced in the State.

California Oil & Gas Assn. Elects Directors for 1942

Ralph B. Lloyd, president of the Lloyd Corp., was elected president of the California Oil and Gas Association at the December meeting of the Association's Board of Directors. A. C. Mattei, president of the Honolulu Oil Corp., W. J. Reid, president of Hancock Oil Co., and Reese H. Taylor, president of the Union Oil Co. of California, were elected vice-presidents. C. A. Johnson, president of the Holly Oil Co., was elected treasurer. F. E. Foster continues as managing director, and D. S. Kilgour continues as assistant manager.

Directors elected for 1942 include: Leigh M. Battson,, Robert S. Lytle, Operator; S. Belither, chairman, Shell Oil Co., Inc.; James B. Black, president, Pacific Gas and Electric Co.; H. D. Collier, president, Standard Oil Co. of California; R. E. Collom, vice-president, Continental Oil Co.; J. A. Crawford, president, Youngstown Steel Products Co.; S. J. Dickey, president, General Petroleum Corp. of California; E. S. Dulin, president, Byron Jackson Co.; LeRoy M. Edwards, vice-president and special counsel, Southern California Gas Co.; O. C. Field, president, O. C. Field Gasoline Corp.; E. B. Gilmore, president, Gilmore Oil Co.; Dana Hogan, president, Hogan Petroleum Co.; R. P. Huggins, general manager, Western Gulf Oil Co.; Wm. F. Humphrey, president, Tide Water Associated Oil Co.; C. S. Jones, president, Richfield Oil Corp.; W. M. Keck, president, Superior Oil Co.; Wm. Reinhardt, vice-president, Union Pacific R. R.; F. C. Ripley, manager, Chanslor-Canfield Midway Oil Co.; L. P. St. Clair, Oil Administrator; J B. Sutherland, division superintendent, Ohio Oil Co.; Lawrence Vander Leck, vice-president, Fullerton Oil Co.; C. P. Watson, vice-president, Seaboard Oil Co. of Delaware; Torrey H. Webb, vice-president, The Texas Co.; A. L. Weil; H. L. Westbrook, vice-president, Belridge Oil Co.; W. C. Whaley, vice-president, general manager, Barnsdall Oil Co.

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Los Angeles Basin

Castaic Wildcat To Resume Drilling

Morse & Mangold Oil Co., Inc., which drilled McDermott No. 1 to 1966 ft. early this year is preparing to resume drilling in search of the Modelo sands productive in the Del Valle and Oak Canyon fields to the south and west. At present bottomed in Pliocene, the well is located in sec. 26,5n-17w about a mile west of highway No. 99 and four miles north of Castaic Junction.

Between the Morse & Mangold well and the Del Valle field, The Texas Co. is drilling Fernando No. 1 below 6675 ft. in sec. 11,6n-17w. Two formation tests of Pliocene showings indicated that formation wet and the well is coring for the Miocene contact.

Walker No. 1, Roy W. Young, Inc.'s Boquet Canyon wildcat in sec. 11,4n-16w, was last reported below the 6900 ft. level in beds thought to be of continental origin. Encouragement is felt, however, because a number of streaks of hard, tight sand giving light cuts and smelling of gas have been cored below 6450 ft. This is taken in some quarters as an indication that productive marine formations may be found below.

Axis Pete Spuds Puente Hills Well

Seeking to extend the newly discovered Turnbull Canyon field three-fourths of a mile to the northwest, Axis Petroleum Co. has spudded its first well in Puente Hills. According to most interpretations, the well is favorably located near the axis of the structure on its northwesterly plunge and should be given a much better chance at production than has the average wildcat. Site of the rig is on the Tandberg property at the intersection of Turnbull Canyon Road and La Mesita Drive and only 300 ft. from the Superior Oil Co. wildcat drilled many years ago. The latter well made many production tests and though a little oil was recovered, methods in vogue at the time failed to effect a water shut-off causing eventual abandonment. It is believed that present day technique can control the water.

Three hundred feet westerly from the discovery well at the corner of La Subida Drive and La Cuesta Ave., Continental Oil Co.'s Turnbull Community No. 2 is coring for the first showings near the 3000 ft.

LOS ANGELES BASIN WILDCATS

Area	Well	No.	Section	Depth	Status
Athens	Rankin & Williams	1	7, 3-13	9483	Idle
Castaic	O'Dell, A. J.	1	9, 4-17		Grading
	Mangold & Morse Oil Co., McDermott	1	26, 5-17	1966	Prep. to deepen
	Young, Roy, W., Inc., Walker	1	11, 4-16	6898	Drilling
	The Texas Co., Fernando	1	11, 4-17	6663	Drilling
Newhall	Airline Oil Co., Perkins	1	11, 3-16	200	Idle
	Aztec Oil Co., Sanborn	1	6, 3-16	6113	Idle
	Barnsdall Oil Co., Limbocher	1	17, 3-16	5700	Drilling
	Rankin & Norell, Ferguson	1	31, 4-16		Rig
	Willis & Assoc., Ferguson	1	30, 6-17	4233	Drilling
Palos Verdes	Surety Holding Co.	1	22, 5-14	1191	Idle
Puente Hills	Axis Pet. Co., Tandberg	1	13, 2-11	510	Drilling
	Continental Oil Co., Turnbull Comm.	2	13, 2-11	2875	Drilling
	Sunset Oil Co., Baldwin	1	11, 2-11	4681	Abandoned
Rio Hondo	Potrero Oil Co., Well	1	32, 1-11	3375	Drilling
San Fernando	Fernando Oils, Ltd., Chatsworth	1	18, 2-16		Foundation
	Shell Oil Co., Mission	2–1	25, 3-16	3000	Drilling
	Tide Water Assoc., Mission	1	26, 3-16	7959	Drilling
	Tide Water Assoc., Sesnon	1	28, 3-16		Grade
Whittier					
La Habra	Los Nietos Valley Oil Co., Woodard	1	29, 2-11	50	Idle
	Union Oil Co., Sansinena	13	30, 2-10	4090	Drilling
	Orange County				
Anaheim	The Texas Co., Spencer	1	1, 4-11	8498	Fishing
Bolsa Chica	La Bolsa Ro. and Synd., Well	1	22, 5-11		Rigged up
Costa Mesa	Thompson, Milton N., Banning	1	9, 6-10	5649	Fishing D.P.
Kraemer	Atlas Oil Co., Kraemer	1	36, 3-9	1235	Drilling
	San Bernardino County				
Chino	Prado Oil Corp., Lamp	1	32, 2-7	1733	Idle

level. Though too close to the 3447 ft. discovery to make any long range predictions, No. 2 will, none the less help to show the general trend of structure.

Rio Hondo Well Resumes Drilling

Potrero Oil Co. Newmann No. 1, located east of Rosemead Blvd. and north of the east extension of Montebello, resumed drilling after a temporary delay and was last reported coring ahead near the 3500 ft. level. Gas showings are said to have appeared on the ditch at times since passing the 3000 ft. mark.

Fernando Oils Starts San Fernando Project

Fernando Oils, Ltd., backed by a group of local property owners, is getting under way on its proposed test of the Chatsworth Park area at the west end of San Fernando Valley. Attorney B. U. Cain, Los Angeles representative, reports that foundations for the derrick are being completed in an orange grove at the northeast corner of Canoga and Lassen Sts. in sec. 18,2n-16w.

Valley Co. Formed For Newhall Well

C. G. Willis & Associates have formed a new organization called the Valley Co. to continue the drilling of their Newhall wildcat, Ferguson No. 1 in sec. 36,4n-17w. Located southeast of the Newhall-Potrero field, the well is now drilling below 4250 ft.

Limbocker No. 1, Towsley Canyon wildcat of Barnsdall, Bandini and Ambassador companies, is coring ahead in hard shale at 5700 ft. Dips are quite steep and showings to date have been few.

Tide Water to Test Deep Aliso Project

With bottom at 7765 ft. approximately 240 ft. below the top of the deep Porter No. 12 zone, Tide Water Associated Oil Co. is reaming to run casing and test its westerly Aliso Canyon outpost, Porter No. 26. No precise correlations have been released as yet by the company but No. 26 appears to have found the top of the deep horizon at about the same point as Porter No. 12 which was completed nearly two years ago as a large producer of gas and high gravity condensate.

Immediately north of Tide Water's production on the Porter lease, Universal Consolidated Oil Co. is deepening the old Standard Oil Co. H. R. Ward No. 1 which was abandoned at 6909 ft. before the discovery of the deep sand. The 5000 ft. sands were missing in this well, being apparently faulted out.

East of the proved Aliso Canyon field, two wildcats are at present attracting much interest. In sec. 26, 3n-16w, Tide Water Associated Oil Co. is again coring ahead after cementing 9 5/8 in. casing at 7708 ft. to protect the hole. Objective now

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is said to be the deep zone of the Aliso field. Nearly a mile to the east, Shell Oil Co. is drilling its Mission No. 2-1 below 3000 ft. after reportedly passing through shallow showings.

West of the canyon field, Tide Water Associated and Standard Oil companies have started road grading work for their joint test, Sesnon No. 1, to be located in sec. 28,3n-16w.

La Habra Test Encounters Fault

Sansinena No. 13, Union Oil Co.'s attempt to extend to the east the small producing area found by Fullerton Oil Co. in the southeast quarter of sec. 25,2s-11w, has now the appearance of a wildcat instead of an extension well. Instead of the expected oil and gas sands, the project has found only badly fractured shale to 4000 ft. and it is apparent the shallow sands have been cut off by faulting. An electric log was recently run and the company is said to be considering abandonment. The well virtually offsets the Fullerton Oil Co. wells across the section line to the west.

Outlook Poor For Anaheim Well

With bottom last reported at 8500 ft., the outlook for The Texas Co. Spencer No. 1 is said to be discouraging. No showings have been reported and close observers vouch for the fact that no tests have been made at any time. The well is located south of Firestone Blvd. between Anaheim and Buena Park in Orange county.

Two Complete Inglewood Wells

Two wells were completed recently in the Inglewood deep zone, the first of which was Hogan Petroleum Co.'s Machado No. 4-A. Bottomed at 8350 ft., the well came in flowing 400 bbls. a day of 31 gravity oil through a 5/64-in. bean. under 1050 lbs. pressure. Second was The Texas Co.'s R. C. Smith No. 8 which was completed at 8300 ft. after a lengthy redrill job. Initial production was 800 bbls. daily through a 48/64-in. bean.

Standard Oil Tests Del Valle Pliocene

In Sepulveda No. 2, and Del Valle, Standard Oil Co. has been making a series of tests which prove the existence of a highly prolific gas zone in the Pliocene above the Miocene oil sands. From 4680 ft. to the present 5245 ft. bottom, a number of drill stem tests have been made, the best of which from 4805 to 4835 ft. where tight, fine, silty, grayish sand with a strong odor was cored. On trial, of this interval, gas reached the surface in one minute and blew at a maximum rate estimated at 17,000,000 cu. ft. per day. A test of the 60 ft. immediately below resulted in a 5,000,000 cu. ft. blow. The well is now coring ahead to complete in the Modelo oil zones.

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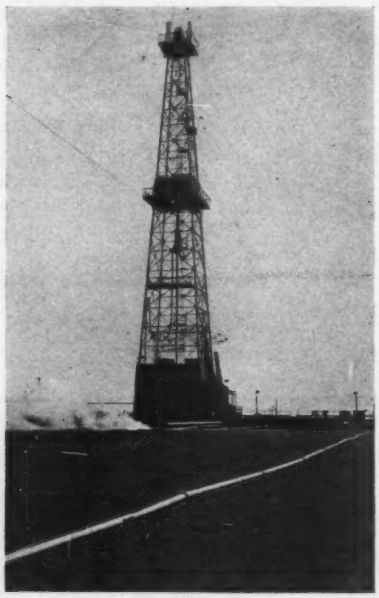
In the same west end group with the Standard well are Ohio Oil Co.'s Vasquez No. 2 which is preparing to complete and Herley-Kelley Videgain No. 2 which is coring at 5900 ft.

R. E. Havenstrite, Operator's Leibhart No. 1, easterly outpost well, was wet on completing at 6975 ft. and is pulling the liner to plug bottom. Havenstrite's Lincoln No. 9 is making a formation test at 6116 ft. and Lincoln No. 10 is drilling at 5500 ft.



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West Dominguez Well Tests For Production

Decker Osbourne & Associates Froom No. 1, west Dominguez outpost which cored 30 ft. of oil sand in the Eighth Callender zone, is preparing to make a production test after landing a liner on bottom at 7740 ft. and cementing through perforations at 7702 ft.

Encouraged by the sand in the Decker Osbourne well, American Seamless Tube Corp. is getting ready to redrill the Gibraltar Drilling Co. well at the southwest corner of Victoria Ave. and Avalon Blvd. Objective will be the Eighth zone.

Recompletion of Havenstrite's earthquake damaged Larronde No. 4 has been held up by the liner freezing just below the window in the 7 in. casing at 6068 ft. The hole was redrilled to the seventh zone at 7190 ft.

E. Richfield Well Cores for Oil Sand

Atlas Oil Co.'s Kraemer No. 1, located on the north flank of the old Kraemer or East Richfield field, is coring for the top of the first oil sand at 1325 ft.

Bartholomae Finishes East Coyote Producer

Completing in the interval 5625-6887 ft., Bartholomae Oil Corp. brought in Stern No. 11 at East Coyote pumping in excess of 500 bbls. a day of 26 gravity oil cutting 6.5 per cent. The well is located in the westerly section of the field near the Fullerton-Brea highway.

New Beach Wells Show Good Yields

Consistently good yields have characterized recent completions in the Huntington Beach field. During the past fortnight H. C. Morton finished Brooks No. 5-A at 3844 ft. pumping 90 bbls. daily of 26 gravity oil cutting less than 8.0 per cent while on a nearby west side

(Continued on Page 25)

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Characteristics of California Crude Oils—

Methods of Analysis

R. C. Mithoff,* G. R. MacPherson,*
and F. Sipos*

California crude oils differ markedly in quality from most other crude oils produced in the rest of the United States in gravity, paraffinicity, sulfur content, and asphalt content. They also differ markedly among themselves in these factors. These wide variations in crude-oil quality lead to the necessity that companies processing California stocks should place considerable emphasis on crude-oil analysis. They also lead to wide variation in the refining methods required. In this paper, crude-oil-analysis methods used by the Standard Oil Company of California are described briefly, the different qualities of the California crude oils are compared with those of oils produced elsewhere in the United States, and a brief description is given of the differences in the required refining processes.

Methods for Analysis of Crude Oils

Crude oils produced in California differ in quality among themselves substantially more than is the case in the Mid-Continent and in the East. The state contains several hundred different pools and zones, each of which produces its own characteristic crude oil. These crudes range in gravity from approximately 6 to 60 deg. API. Some contain essentially no gasoline, and others contain as much as 85 per cent of gasoline with a 390-deg.-F end point. Other qualities vary equally widely.

This situation leads to the necessity of placing considerable emphasis upon procedures for analysis of crude oils, and upon the results therefrom. A brief description is given hereinafter of the main procedures for analysis of crude oils employed by the Standard Oil Company of California.

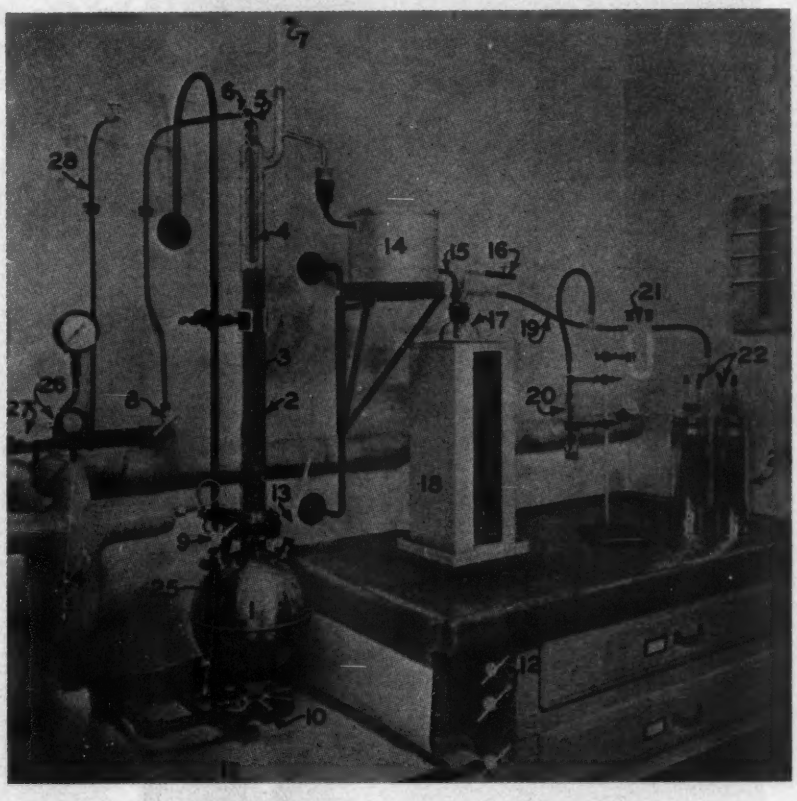
Crude Analysis Methods "A," "B," and "D"

The equipment developed and used by the Standard Oil Company of California for making analyses by the methods designated "A," "B," and "D" is shown in Fig. 1. It consists of a 5-liter stainless steel flask equipped with a 29-in. glass column made from 45-mm pyrex-glass tubing. The column is filled to a depth of 18 in. with 4-mm x 6-mm glass nipples, and is fitted at the top with an internal reflux condenser. The column is protected against heat loss by a readily removable, 85-per-cent magnesia insulating jacket. The distillate is condensed in an ice-cooled stainless-steel condenser, and collected in an ice-cooled, stopper, 2,000-ml. graduated cylinder. A vapor-recovery system is connected to the vent from the receiver. It consists of a calcium-chloride drier and after condensers cooled with a slurry of solid carbon dioxide and chloroform.

The method of heating the flask is an important feature. A cast-iron star burner of the usual type used in hot plates is employed, except that the venturi section is replaced by tight connections to the gas and compressed-air supplies. The gas is discharged into the mixing section through the usual jet. This arrangement permits accurate and reproducible control of the height and temperature of the flame.

Safety features include use of a wire-inserted clear-glass safety shield in front of the still, a metal flask, a sand-filled catch pan below the flask, and a mercury bubbler pressure relief on the line to the after-condenser.

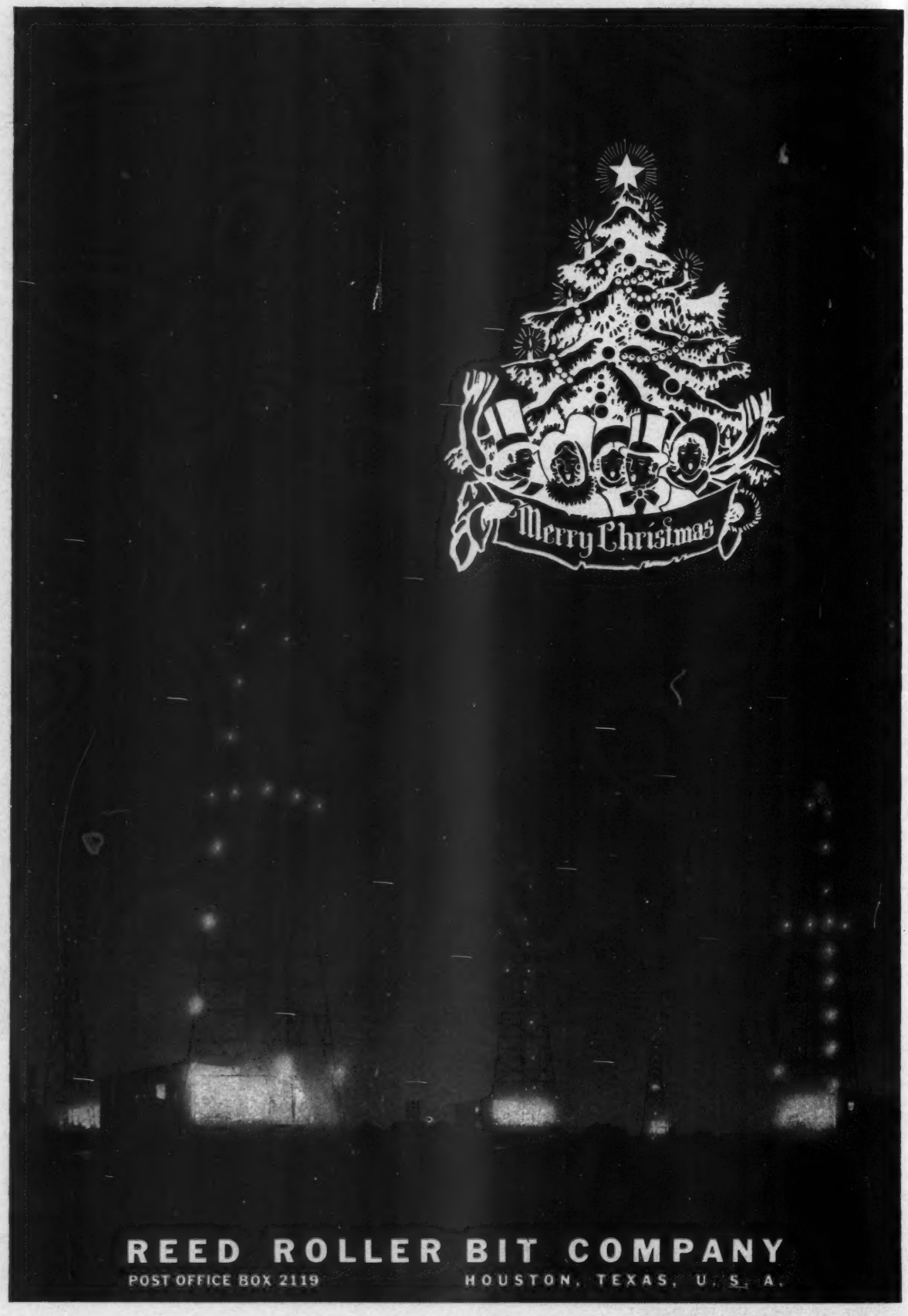
About 4,000 ml. of crude oil is charged to the still by means of a siphon through the steam connection on the flask. It then is warmed gently for about 15 minutes or until the crude is dehydrated, and foaming and bumping have ceased. The flame then is regulated to produce net overhead at the rate of about 0.2 per cent of the volume of charge per minute. When the vapor line reaches 225 deg. F., the insulation is put onto the column, and



1. Distillation flask (5,000-ml)
2. 20-in. fractionating column
3. Column packing
4. Reflux condenser
5. Inlet air to reflux condenser
6. Air outlet to atmosphere
7. ASTM thermometer, 30 to 580 deg. F.
8. Air-control valve
9. Steam-control valve to still
10. Burner, air-gas-mixture blow-type
11. Sand-filled safety catch pan
12. Controls for gas and air valves
13. ASTM thermometer, 30 to 760 deg. F.
14. Condenser
15. Overhead rundown line
16. Gas-absorbing line
17. Receiver, 2,000-ml. capacity
18. Receiver holder (ice and water bath)
19. Gas vent line
20. Safety pressure release
21. Calcium-chloride drier
22. After-condensers
23. Holders for after-condensers
24. Steam superheater
25. Flange support
26. Low-pressure steam valve
27. High-pressure steam valve
28. Water line for reflux condenser

Distillation Apparatus for Crude Analysis—5-Liter Still.
Fig. 1

*Standard Oil Co. of Calif., San Francisco, Calif. Presented before Twenty-second Annual Meeting of the American Petroleum Institute, in San Francisco, Calif., November 5, 1941.



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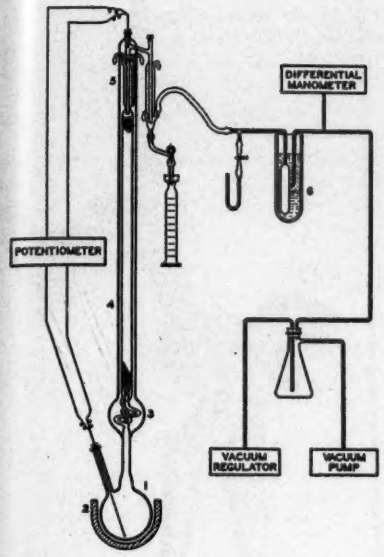


1. 2-liter flask
2. Bag-type electric heater
3. Thermal-expansion joint
4. Electrically heated, vacuum-jacketed column, 28-mm ID
5. Internal reflux condenser
6. Carbon-dioxide–chloroform after-condenser

Apparatus for True-Boiling Distillation.

FIG. 2

air admitted to the reflux condenser. The flame and air are regulated so that the distillation rate is maintained, and so that the column operates just slightly below the flooding stage.

A first cut, somewhat lighter than the lightest gasoline to be made, is collected and stored, with provision to prevent loss of light end. One-per-cent cuts then are collected in open graduated cylinders, until the end of the distillation. Superheated steam is introduced as a distillation aid when the still temperature reaches 550 to 625 deg. F.

With heavy or wet crude oils it is sometimes necessary first to distill the crude oil in a larger metal still without fractionation, to produce a wide blanket overhead cut, which later is redistilled in the previously described equipment.

The operating procedure for methods "A," "B," and "D" differ only in the depth to which the crude oil is distilled. The stock is run so that the different cuts can be blended proportionately to produce the following stocks:

Method "A"

Gasoline of 390 deg. F. end point.

Residuum following 390 - deg. - F. - end-point gasoline.

Method "B"

Gasoline of 390 deg. F. end point.

Kerosine distillate (400 Saybolt-Thermo viscosity) following 390-deg-F-end-point gasoline.

Residuum following the foregoing kerosine.

Method "D"

Three gasolines: end point, respectively, 340, 390, and 437 deg. F.

Kerosine distillate (360 Saybolt-Thermo viscosity) following 340-deg.-F.-end-point gasoline.

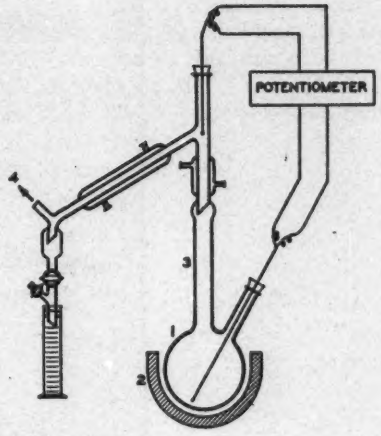
Kerosine distillate (360 Saybolt-Thermo viscosity) following 390-deg.F.-end-point gasoline.

Gas oil (viscosity, 40 sec. Saybolt Universal, at 100 deg. F.) following 390-deg.-F.-end-point gasoline.

Residuum following 390-deg. F. end-point gasoline. Residuum following 400-viscosity kerosene.

Residuum following 40-viscosity gas oil.

Appropriate inspections of each stock are obtained. The results are recorded in tabular form on a single sheet of paper, one crude oil to each sheet. These sheets are bound in loose-leaf books, which are revised and kept up to date as new data become available. Table 1 shows the results of a method "D" analysis of a typical crude oil from Long Beach field, California.



1. 2-liter flask
2. Bag-type electric heater
3. Insulated open column (Vigreaux type), 28-mm ID×254 mm
4. Connection to vacuum system

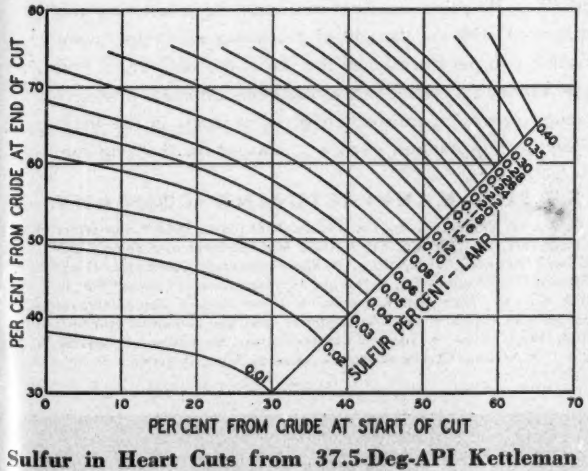
Modified True-Boiling Apparatus for Heavy Residuum.

FIG. 3

True-Boiling-Point Analysis

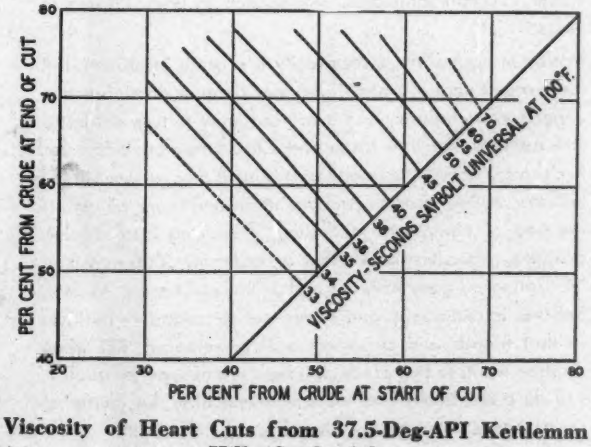
A schematic diagram of the equipment used by the Standard Oil Company of California for true-boiling-point distillation of crude oils is shown in Fig. 2. The equipment consists essentially of a 2-liter glass flask attached to an electrically heated, vacuum-jacketed glass column packed with 32 in. of 8-mm glass raschig rings. The overall height of the still—including flask, expansion joint, column, reflux condenser, and thermo-couple well—is about 61 in. The flask is heated with a bag-type electric heater. The auxiliary equipment includes a condenser, receiving system and vacuum control equipment.

A chilled 1,500-ml. sample of the crude oil is charged to the flask and distilled at a reflux ratio of approximately 8 to 1—producing about 1.5 ml. of net overhead



Sulfur in Heart Cuts from 37.5-Deg-API Kettleman Hills Crude Oil.

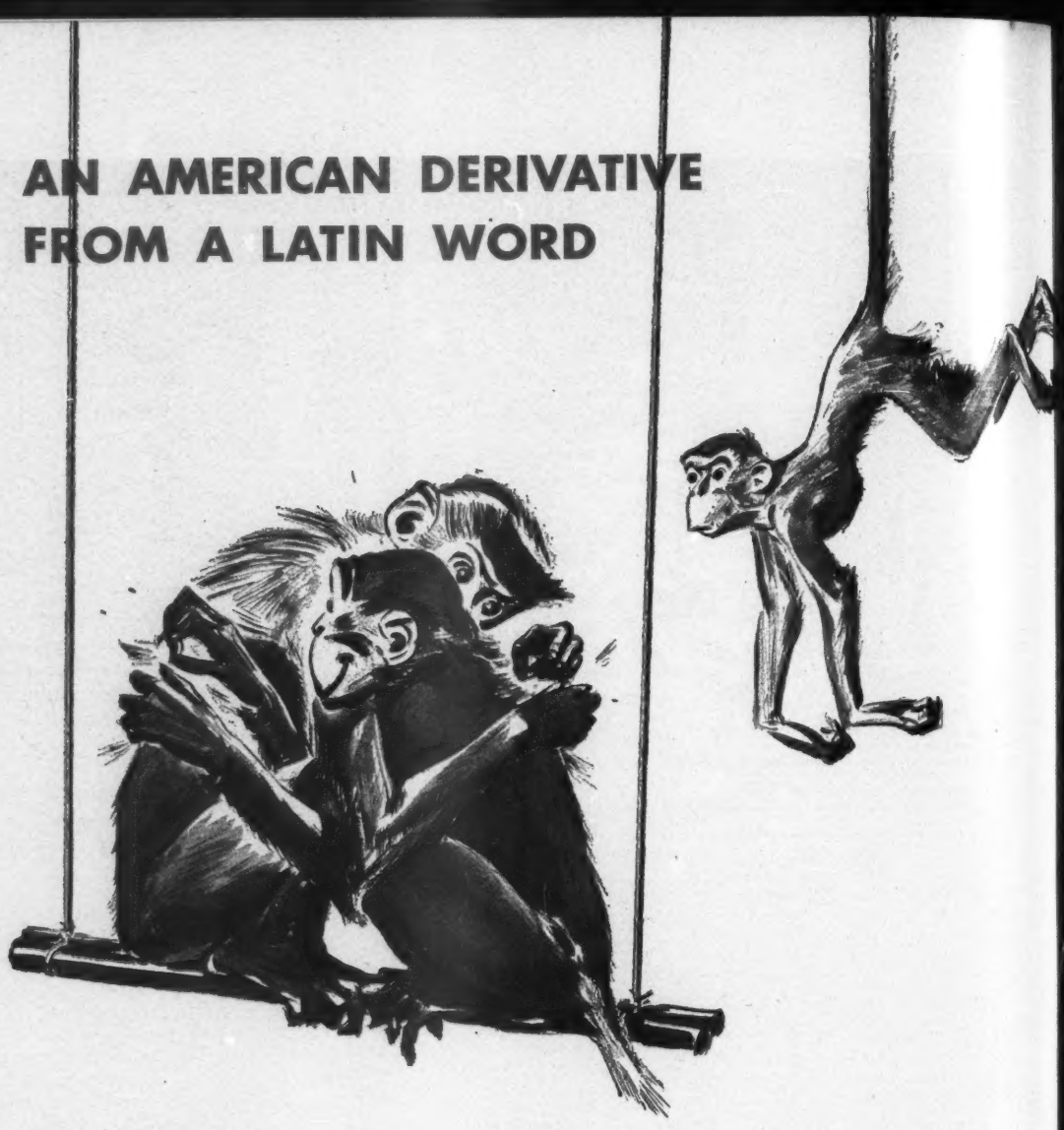
FIG. 4



Viscosity of Heart Cuts from 37.5-Deg-API Kettleman Hills Crude Oil.

FIG. 5

AN AMERICAN DERIVATIVE FROM A LATIN WORD



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per minute. The temperature of the still and vapor line is recorded at times corresponding to each 2 per cent overhead. Cuts corresponding to each 4 per cent from still charge are collected separately.

The distillation is performed at atmospheric pressure, until the still temperature reaches 635 deg. F. The still is then cooled, evacuated to 10-mm. pressure, and again run to 635-deg. F. still temperature. The still is cooled, and the contents transferred to the still (shown in Fig. 3) which has a shorter column. This still is evacuated to about 1-mm. pressure, and run to 635-deg. F. still temperature as before. In the case of lean or heavy crude oils, the stock sometimes is charged directly to the still shown in Fig. 3, and the entire distillation performed therein.

On the appropriate 4-per-cent cuts, the following tests are obtained:

1. Gravity.
2. Kinematic viscosity at two or three temperatures.
3. Sulfur.
4. Neutralization number.

TABLE 1

Method "D" Analysis of Typical Crude Oil from Long Beach Field, California

		Gasolines				Kerosine Distillate		Gas Oil	Residuum After		
			390-Deg-F-End-Point								
	Dry Crude	340-Deg-F. End-Point	Untreated	Butane-free	437-Deg-F. End-Point	360-Viscosity (Saybolt-Thermo) After 340-Deg-F. End-Point	400-Viscosity (Saybolt-Thermo) After 390-Deg-F. End-Point	40-Viscosity (Saybolt Universal) at 390 Deg F After 390-Deg-F. End-Point	390-Deg-F. End-Point-Gasoline	400-Viscosity Kerosine Distillate	40-Viscosity Gas Oil
Yield:											
Percentage net from crude as received..	....	15.6	20.8	20.8 *	25.5	14.4	7.2	31.2	79.2	72.0	48.0
Percentage from butane-free crude.....	....	....	....	20.8 *	....	....	....	....	....	....	....
Percentage range from crude.....	....	0-15.6	0-20.8	....	0-25.5	15.6-30.0	20.8-28.0	20.8-52.0	20.8-100.0	28.0-100.0	52.0-100.0
Butanes and lighter, per cent *.....	0.0	....	0.0	....	....	....	....	....	....	....	....
Gravity, deg API.....	25.1	57.2	53.8	....	51.1	40.1	38.9	32.7	19.3	17.7	11.6
Flash point:											
Tag. closed cup, deg F *.....	....	....	....	....	....	135	165	....	....	....	....
Pensky-Martens, deg F *.....	....	....	....	....	....	....	....	213	....	....	....
Cleveland open-cup, deg F.....	....	....	....	....	....	....	....	....	250	300	470
Viscosity:											
Saybolt-Thermo	....	....	....	....	....	355	395	....	....	....	....
Saybolt Universal at 35 deg F, sec.....	1,030	....	....	....	....	....	....	....	....	....	....
Saybolt Universal at 70 deg F, sec.....	247	....	....	....	....	....	....	45.3	....	....	....
Saybolt Universal at 100 deg F, sec.....	121	....	....	....	....	....	....	39.0	724	....	....
Saybolt Universal at 130 deg F, sec.....	....	....	....	....	....	....	....	....	301	541	....
Saybolt Universal at 210 deg F, sec.....	....	....	....	....	....	....	....	....	69	93	777
Pour point, deg F.....	+15	....	....	....	....	....	....	+15	+45	+50	+85
Sulfur, per cent by weight.....	1.16	0.040	0.058	....	0.088	0.22	0.245	0.78	1.40	1.48	1.73
Wax (Holde), per cent.....	2.20	....	....	....	....	....	....	....	....	3.11	....
Water and sediment, per cent.....	0.20	....	....	....	....	....	....	....	....	....	....
Water by distillation, per cent.....	0.20	....	....	....	....	....	....	....	....	....	....
Reid vapor pressure, lb.....	1.75	....	....	....	....	....	....	....	....	....	....
Saponification No.	0.67	....	....	....	....	....	....	....	....	0.64	....
Conradson carbon residue, per cent.....	....	....	....	....	....	....	....	....	7.61	8.81	11.7
Delay cetane No.*.....	....	....	....	....	....	39.2	41	47	....	....	....
Neutralization No., mg of potassium hydroxide per gram	....	....	....	....	....	....	0.30	0.57	....	....	....
Aniline point, deg F.....	....	....	....	....	....	....	136	146.5	....	....	....
Characterization gravity, deg API.....	....	....	....	....	....	....	....	....	....	27.2	....
Smoke tendency (lamp), mm.....	....	....	....	....	....	32	33	....	....	....	....
Octane No., CFR motor method:											
Clear	....	63.5	59.9	....	55.0	....	....	....	....	....	....
Plus 1.0 ml TEL † per gal.....	....	....	69.0	....	....	....	....	....	....	....	....
Plus 2.0 ml TEL † per gal.....	....	....	73.5	....	....	....	....	....	....	....	....
Natural gasoline to obtain 170 deg F at 20-per-cent point *	....	....	30.4	....	....	....	....	....	....	....	....
Octane No. after natural-gasoline blending *..	....	....	64.5	....	....	....	....	....	....	....	....
Average boiling point.....	....	243	271	....	300	413	431	552	....	....	....
	D-158	D-86	D-86	....	D-86	D-86	D-86	D-158	....	....	....
ASTM Distillation, in Deg F:											
Initial boiling point.....	140	126	133	....	142	356	398	432	....	....	....
5-per-cent point	260	173	183	....	188	367	407	470	....	....	....
10-per-cent point	300	190	202	....	210	377	412	478	....	....	....
20-per-cent point	416	209	226	....	238	386	418	492	....	....	....
30-per-cent point	516	223	244	....	260	394	421	508	....	....	....
40-per-cent point	599	234	258	....	271	401	425	526	....	....	....
50-per-cent point	....	244	273	....	299	409	428	545	....	....	....
60-per-cent point	....	255	289	....	319	419	433	571	....	....	....
70-per-cent point	....	265	303	....	342	429	438	591	....	....	....
80-per-cent point	....	281	324	....	372	441	445	612	....	....	....
90-per-cent point	....	293	343	....	399	457	456	644	....	....	....
95-per-cent point	....	310	363	....	422	472	468	658	....	....	....
End point	625	340	390	....	437	483	477	680	....	....	....
Recovery, per cent.....	44.5	99.0	99.0	....	99.0	98.0	99.0	99.0	....	....	....
Loss, per cent.....	....	0.0	0.0	....	0.0	....	....	....	....	....	....

* Estimated.
† Tetraethyl lead.

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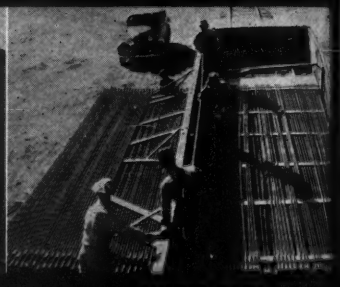
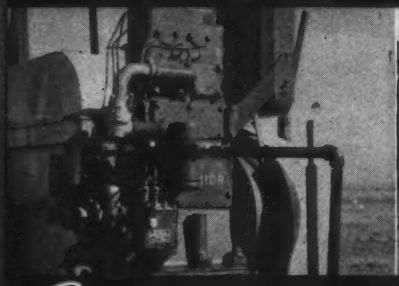


SUCKER RODS



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5. Pour point.
6. Aniline point.
7. Molecular weight (from gravity and boiling point).

Neither ASTM distillations nor octane numbers are obtained on the cuts from the true-boiling distillation.

The data from the true-boiling distillation are of considerable value when used in conjunction with results of method "D" analysis to estimate the yield and quality of distillates other than those shown in the "D" method. It is, therefore, the practice in the Standard Oil Company of California to correlate the results of true-boiling distillations and method "D" analyses on each crude oil on which both sets of data are obtained, and to prepare a separate report and set of charts for each of such crude oils.

Table 2 shows the results of a true-boiling-point distillation of a typical crude oil from the Long Beach Field, California.

Characterization Gravity

The characterization gravity is a test developed several years ago by the Standard Oil Company of California to measure the paraffinicity of heavy oils. It serves essentially the same purpose as does the UOP characterization factor "K,"[1a] except that it is susceptible of more accurate measurement. The characterization gravity also affords a somewhat more accurate means of estimating the octane number of gasoline made by cracking heavy residuums than does the UOP "K."

The characterization gravity is the arithmetic average of the instanteous gravities of the distillate boiling at 350-, 450-, and 550-deg.F. vapor-line temperature at 25 mm. pressure in a true-boiling-point distillation. It may be calculated from any true boiling point distillation by means of a Cox chart, provided the true-boiling-point distillation is carried far enough. It often is determined also on heavy residuums by the performing of a special true-boiling point distillation at 25-mm. pressure in the still shown in Fig. 3.

The characterization gravity is determined on essentially all unfamiliar crude oils analyzed by Standard Oil Company of California, and is used primarily to classify the stock as to its paraffinicity.

Heart-Cut Analysis

The heart-cut analysis is made on crude oils for which highly detailed analytical data are desired. About 15 gallons of the crude oil is run with good fractionation in a 20-gallon metal still equipped with an efficient fractionating column. Steam may be used as a distillation aid, and vacuum may be employed. The crude oil is separated into narrow-boiling cuts, each corresponding to about 5 per cent yield from the original crude oil. The narrow cuts are blended proportionally to produce a large number of gasolines, heart cuts, and residuums of different boiling ranges, and detailed inspections are obtained. The first cut usually is rectified before blending.

If the analysis is not to be carried in excess of approximately 700 deg. F., the raw crude oil may be used in the foregoing distillation. If heavier cuts are to be made, it is necessary first to run the original crude oil to pitch without fractionation, producing a blanket overhead cut, which later is rerun with fractionation to produce the narrow cuts.

The resulting data are correlated, and plotted upon charts showing the different qualities as functions of the per cent from crude oil at the start and at the end of the desired distillate. Fig. 4 and 5 are examples of charts of this type, showing the sulfur and viscosity of heart cuts from a crude oil from the Kettleman Hills Field.

[1a] Figures refer to bibliography on p. 13.

TABLE 2

True-Boiling-Point Distillation of Typical Crude Oil from Long Beach Field, California

Gravity of Crude Oil—25.1 Deg API

Distillation Data						Inspections of Cuts											
							Viscosity										
							Kinematic (Centistokes):			Saybolt-Universal (Seconds):							
Vapor Temperature (Deg F)	Volume Distilled Based on Crude (Per Cent)	Pressure (Millimeters of Mercury), Absolute)	Temperature, Converted to 760 Mm Pressure (Deg F)	Mid-point (Per Cent Distilled)	Vapor Temperature at Mid-point Per Cent Distilled (Deg F)	Gravity (Deg API)	100 Deg F	130 Deg F	210 Deg F	100 Deg F	130 Deg F	210 Deg F	Saybolt-Thermo *	Sulfur (Per Cent by Weight)	Neutralization No. (Milligrams of Potassium Hydroxide Per Gram of Oil)	Pour Point (Deg F)	Aniline Point (Deg F)	Molecular Weight
143	2		143	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
166	4		166	2	143	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
190	6		190	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
240	8		240	6	190	56.6	0.65	0.56	0.42	...	...	...	...	0.010	.....	.....	...	100 †
260	10		260	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
281	12	754	281	10	260	53.8	...	...	...	...	...	...	...	.....	0.142	Below—70	124	...
305	14		305	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
327	16		327	14	305	48.4	0.88	0.74	0.51	...	...	...	188	0.066	.....	.....	...	127 †
354	18		354	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
380	20		380	18	354	44.1	...	...	...	...	...	...	...	.....	0.154	Below—70	125	130
406	22		406	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
428	24		428	22	406	40.5	1.46	1.16	0.73	...	...	...	333	0.19	.....	.....	...	157 †
205	26		430	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
218	28		447	26	430	37.0	...	...	...	...	...	...	...	.....	0.257	—65	134	...
238	30		474	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
260	32		503	30	474	35.7	2.34	1.76	1.01	33.9	...	...	553	0.40	.....	.....	...	179 †
276	34	10	523	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
300	36		555	34	523	32.9	...	...	...	...	...	...	...	.....	0.628	—15	142	...
320	40		579	38	...	32.5	4.74	3.22	1.56	41.5	36.8	...	...	0.79	.....	.....	...	211 †
328	42		590	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
340	44		604	42	590	31.4	...	...	...	...	...	...	...	.....	0.995	+15	159	...
328	47		705	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
327	49		704	47	705	26.6	14.53	8.27	2.99	75.4	53.0	36.2	...	1.19	.....	.....	...	282 †
346	51	0.85	730	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
363	53		753	51	730	24.8	...	...	...	...	...	...	...	.....	1.015	+60	159	...
374	55		768	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
386	57		776	55	768	23.3	35.0	17.10	4.83	163.2	85.7	42.0	...	1.25	.....	.....	...	308
439	59		841	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
452	61	1.05	861	59	841	21.9	...	...	...	...	...	...	...	.....	1.225	+80	169	380 †
479	63		897	..	...	...	...	...	...	...	...	...	...	.....	.....	.....	...	...
492	65		912	63	897	19.8	162	59.3	10.53	747	275	61.0	...	1.33	.....	.....	...	410 †
523	67		955	66	933	19.1	...	...	...	1,350 †	447	74.9	...	.....	1.210	.....	172	...
Bottoms	33	...	...	..	...	8.3	[Flash point (Cleveland), 565 deg F]		...	...	...	6,600	...	1.97	.....	+110	(Conradson carbon residue, 15.36 per cent)	

* Converted from kinematic viscosity at 100 deg F.
† Estimated.

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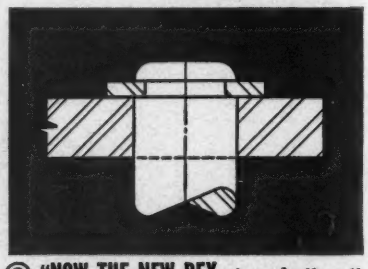
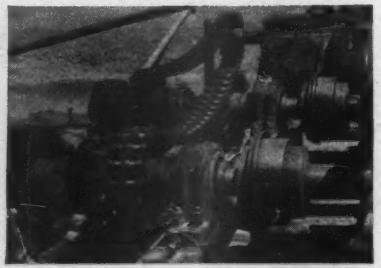


③ **"NOW THE NEW REX** riveted oil well chain is remarkably easy to take apart: its rivet head is so small that when the pin is driven out, the head cannot score the sidebar hole or the inner surface of the bushing. Know what this means?

④ **"IT MEANS THAT WHEN** you take apart a Rex riveted chain, you do not destroy the sidebar as you do when taking down other types of riveted chain. In other words, you save one link—as much as a third of a foot of chain!



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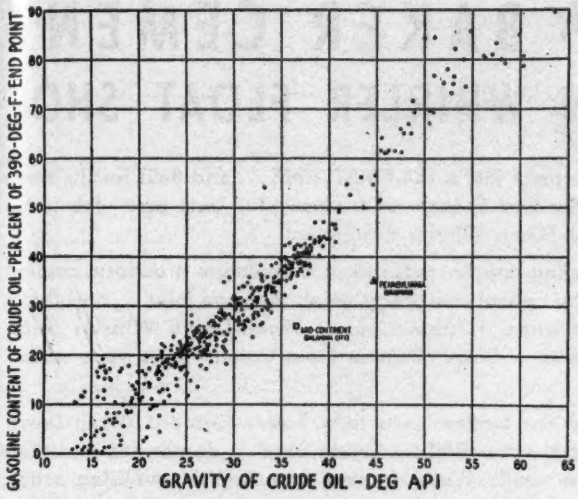
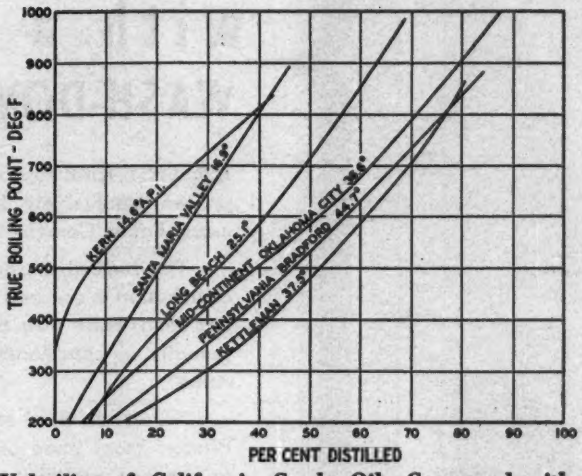


Gasoline Content of California Crude Oils as a Function of Gravity.

FIG. 6



Volatility of California Crude Oils Compared with Mid Continent and Pennsylvania Oils.

FIG. 7

Conventional charts showing quality of gasolines and of residuums vs. yield from crude oil are prepared also from the foregoing data. True-boiling-point analysis, fractional analysis, and an equilibrium-flash breakdown usually are obtained also on the crude oil as a supplement to the heart-cut analysis.

Characteristics of Crude Oils

No truly satisfactory method exists for grouping or classifying California crude oils among themselves. If they are classified according to any one property, the resulting grouping is unsatisfactory from the standpoint of several other important properties.

A few approximate generalizations can be stated, however. For example, most of the more naphthenic crude oils, i.e., with characterization gravity of 23 deg. or lower, are of 27 deg. API gravity or heavier. Similarly all light California crude oils, 28 deg. API or lighter, are relatively paraffinic, of about 26 to 30 deg. characterization gravity. Most of the high-sulfur crude oils ahe heavier than about 20 deg. API; however, sulfur content bears little relation to the degree of paraffinicity, and many relatively heavy crude oils are of low sulphur content.

The crude oils are sometimes classified as "refinable" and "non-refinable." In this paper refinable crude oils are assumed to contain more than about 3 per cent of straight-run gasoline; the non-refinable ones, less than 3 per cent. For certain purposes this grouping is convenient; however, it bears little relation to any other property of the stocks. For example, the refinable crude oils may be paraffinic or napthenic, of high sulfur content or of low sulfur content, and waxy or non-waxy. The refinable crude oils are usually those of higher API gravity; however, API gravity is not a measure of so-called refinability. For example, a 16-deg.-API-gravity California crude oil may have a gasoline content ranging from 0 to 20 per cent, and may be either non-refinable or refinable.

Crude oils from the San Joaquin Valley fall into two main groups, produced in about equal volume. The first group includes the heavier and more naththenic oils, most of them ranging in API gravity between approximately 14 and 25 deg., and in characterization gravity from 19 to 23 deg. Up to about 1930, most of the valley production was of this type. Midway-Maricopa district produces oil representative of this type.

The second group includes lighter and more paraffinic crude oils, most of them lighter than about 30-deg-API gravity, and with a characterization gravity between 26 and 30 deg. Kettleman, Coalinga Eocene, and Coles Levee are representative. Most of the production in this group is from fields opened in recent years—especially from deeper, older geologic zones.

The relationship to geologic age appears to be general throughout California. Deep wells producing from geologically older strata usually yield lighter, more paraffinic oil of lower sulfur content than do shallower wells in the same field producing from geologically younger rock.

Typical crude oil from the southern California fields is intermediate in gravity and paraffinicity between the two main San Joaquin Valley types, but is of appreciably higher sulfur content than is either of the two. However, stocks from the different southern California fields differ widely among themselves in gravity, gasoline content, paraffinicity, and sulfur content.

Most of the crude oil produced in the California coastal area resembles the lighter group of oils produced in the San Joaquin Valley. However, the coastal area also produces considerable oil of markedly different types, such as the high-sulfur low-gravity Santa Maria Valley crude oil.

Gravity

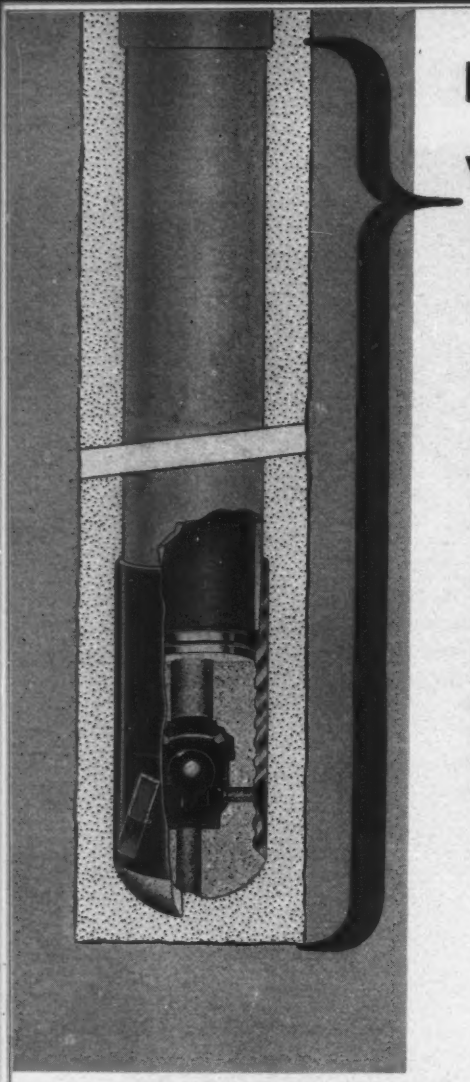
California crude oils range in API gravity from about 6 to 60 deg. The heaviest ones are essentially asphalt, and the lightest may contain more than 85 per cent of gasoline with an end point of 390 deg F. Most of the production in the state is within the API gravity range of 18 to 38 deg. The weighted-average production in the entire state is of about 27 to 28 deg. API.

As compared to this, most Pennsylvania crude oils are of about 40 to 45 deg API, and Mid Continent about 35 to 40 deg API. East Texas averages around 40; West Texas is in the range of about 30 to 40, and the two Gulf Coastal types probably are in the ranges 19 to 25 and 30 to 40, respectively. Therefore, California crude oils, on the average are substantially heavier than are most crude oils produced east of the Rockies.

Volatility

California crude oils differ widely among themselves in volatility. Some are more than 85 per cent asphalt, and some contain more than 85 per cent gasoline.

Fig. 6 shows the relation between the API gravity of about 500 different California crude oils and their gasoline content. As shown in Fig. 6, the lighter crude oils usually contain the most gasoline; however, the gravity of a given oil is not a satisfactory measure of its gasoline content. For example crude oil of 16 deg. A.P.I. gravity may contain from



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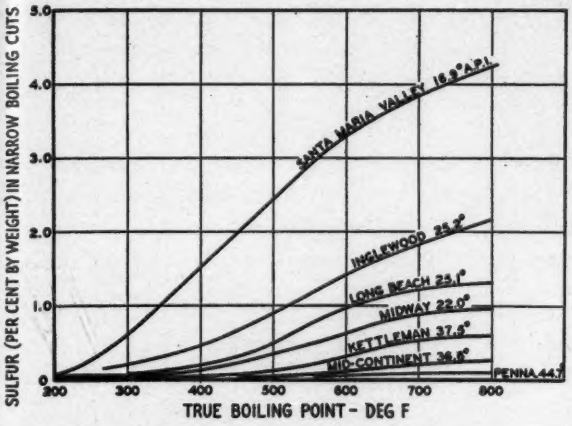
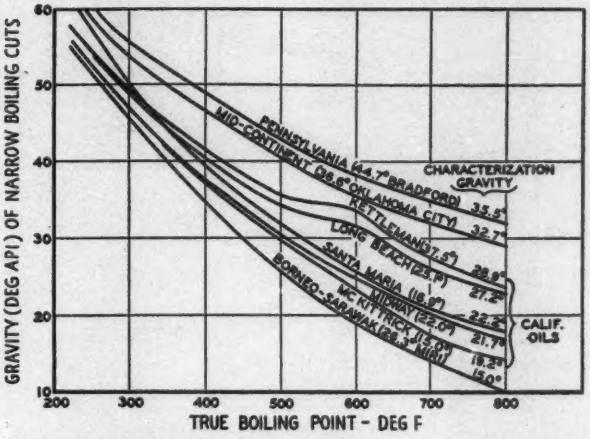


Sulfur Distribution in California Crude Oils Compared with Mid Continent and Pennsylvania Oils.

FIG. 8



Gravity–Boiling-Point Relationship for Different Crude Oils.

FIG. 9

0 to about 20% gasoline—depending upon its source, boiling characteristics, and paraffinicity.

Points corresponding to typical Pennsylvania and Mid-Continent crude oils are included in Fig. 6. These oils contain substantially less gasoline than do California crude oils of the same gravity, due to their more paraffinic character and lower asphalt content.

The yield vs. true-boiling-point relationship for several typical California and eastern crude oils is shown in Fig. 7. In this regard the different California oils differ markedly among themselves. The relative percentage of oil boiling in different ranges varies considerably, and may or may not be similar to that in Mid-Continent, Pennsylvania, and Texas crude oils.

Viscosity

The heavier California crude oils are substantially more viscous than are most Pennsylvania, Mid-Continent, or Texas crude oils, due primarily to their higher boiling points and higher asphalt content. This leads to a problem in pipeline transportation, due to the high pressure drop. Transportation by tanker has been adopted in many cases to avoid this difficulty.

California oils of a given boiling range are appreciably more viscous than are Pennsylvania or Mid-Continent oils of the same boiling range. This difference is in accord with the difference in paraffinicity. For example, gas oils with an average boiling point of 700 deg. F. from Pennsylvania, Mid-Continent, Kettleman Hills (California), and Midway (California) crude oils have a Saybolt- Universal viscosity, respectively, of 66, 71, 74, and 120 sec. at 100 deg. F.

Residuum stocks from California crude oils are substantially heavier, both in gravity and viscosity, than are corresponding residuums from eastern crude oils. For example, residuums following kerosine distillate from Mid-Continent, Kettleman Hills, and Midway crude oils have, respectively, an API gravity of approximately 29, 23, and 15 deg., and a Saybolt-Universal viscosity of 90, 100, and 770 sec. at 130 deg. F.

Wax-free lubricating-oils distillate from California crude oils is of a viscosity index ranging from about —200 to +30. Solvent refining and dewaxing of distillates or residuums from selected crude oils, however, produce high-quality lubricants of 90 to 100 viscosity index.

Sulfur Content

The sulfur content of California crude oils is, in most cases, far higher than that of Pennsylvania and Mid-Continent oils, and substantially higher than that of most Texas oils. California crude oils range in sulfur content from about 0.1 to 6 per cent. San Joaquin Valley crude oils allf into two groups; paraffinic oils of about 0.3 to 0.4 per cent sulfur content, and naphthenic oils of 0.7 to 1.0 per cent sulfur content. Average southern California crude oil contains about 1.0 to 1.5 per cent sulfur. Most Pennsylvania and Mid-Continent crude oils contain about 0.1 to 0.3 per cent sulfur, and those from Texas perhaps 0.2 to 3.0 per cent.

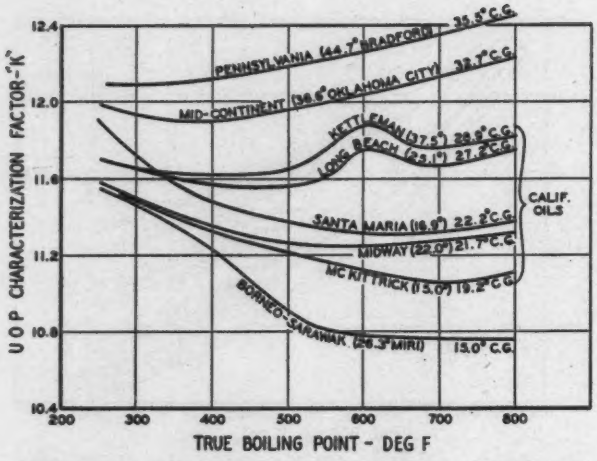
The sulfur distribution in several different crude oils is shown in Fig. 8. Kettleman Hills is classified as of low sulfur content; yet distillates therefrom contain two to five times as much sulfur as do corresponding Pennsylvania and Mid-Continent distillates, and about the same amount as do distillates from East Texas crude oil. Distillates from high-sulfur California crude oils, such as Santa Maria Valley and Inglewood, may contain as much as 1 to 4 per cent sulfur, or perhaps 20 times as much as does the corresponding distillate from Mid-Continent crude oil

Residuum cracking stocks processed in California are usually of high sulfur content, ranging from about 0.9 to 2.0 per cent, and averaging about 1.3 to 1.7 per cent. They are far more corrosive to cracking equipment than are most Mid-Continent and Texas stocks. Vessels and lines must be protected against corrosion—chrome-alloy lines and vessel lining frequently being employed. A substantial part of the cracking-unit furn aces processing California stocks are equipped throughout with 18-8 chrome nickel tubes for corrosion protection.

The chemical character of the sulfur-bearing compounds in California crude oils is substantially different from that of the compounds in any crude oil produced east of the Rockies with which the authors are familiar. Most California crude oils, as produced, are almost free of hydrogen sulfide and are low in mercaptan-sulfur content. The raw straight-run gasolines usually are slightly sour to the doctor test, however. Texas stocks, for example, are much higher both in hydrogen sulfiide and mercaptan sulfur.

In low-pressure distillation, California oils produce much less hydrogen sulfide than do Texas oils. Cracking of California residuum, however, produces considerable hydrogen sulfide and mercaptan sulfur, as well as considerable heavier sulfur compounds not of the mercaptan type.

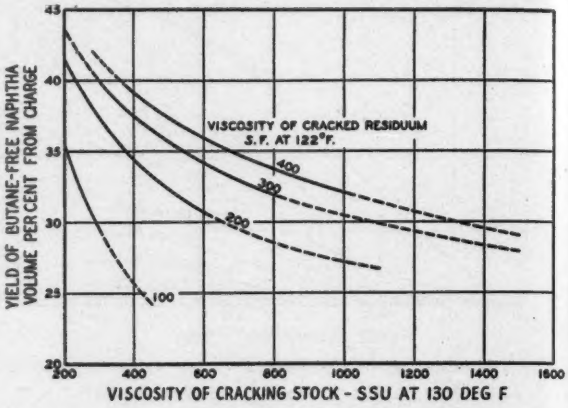
The sulfur compounds in California cracking stock appear to be more stable to heat than are those in Texas oils. On cracking, the sulfur in Texas oil tends to form hydrogen sulfide and to appear in the gas—producing relatively low-sulfur naphtha. The sulfur compounds in California oil tend to split into compounds of intermediate boiling range and appear in the naphtha, which is of rela-


U O P CHARACTERIZATION FACTOR-"K"
TRUE BOILING POINT - DEG F
PENNSYLVANIA (44.7° BRADFORD) 35.5° C.G.
MID-CONTINENT (36.6° OKLAHOMA CITY) 32.7° C.G.
KETTLEMAN (37.5°) 28.9° C.G.
LONG BEACH (25.1°) 27.2° C.G.
SANTA MARIA (18.9°) 22.2° C.G.
MIDWAY (22.0°) 21.7° C.G.
MC KITTRICK (13.0°) 19.2° C.G.
BORNEO-SARAWAK (26.3° MIRI) 13.0° C.G.
CALIF. OILS

Variation in UOP Characterization Factor "K" with Boiling Point.

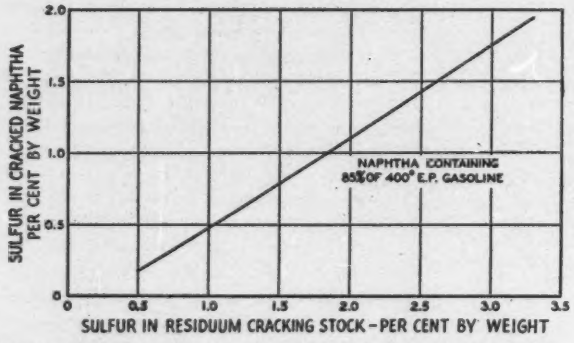
FIG. 10

Gravity is not a satisfactory measure of the yields obtainable in cracking California residuums because of


YIELD OF BUTANE-FREE NAPHTHA VOLUME PER CENT FROM CHARGE
VISCOSITY OF CRACKED RESIDUUM S.F. AT 122°F.
400
300
200
100
VISCOSITY OF CRACKING STOCK - SSU AT 130 DEG F

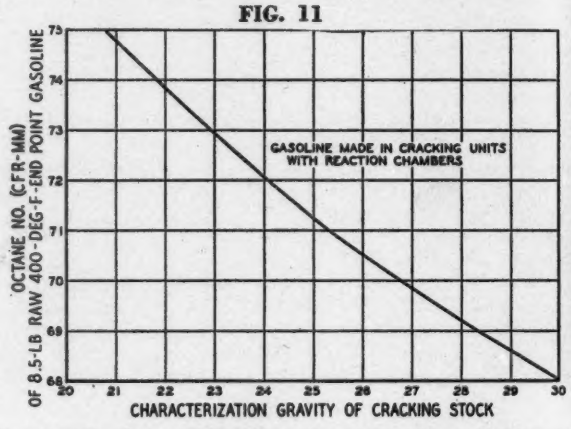
Viscosity-Yield Chart for Cracking California Residuum.

FIG. 11


SULFUR IN CRACKED NAPHTHA PER CENT BY WEIGHT
NAPHTHA CONTAINING 85% OF 400° E.P. GASOLINE
SULFUR IN RESIDUUM CRACKING STOCK - PER CENT BY WEIGHT

Sulfur Relationship in Cracking California Residuum

FIG. 12


OCTANE NO. (CFR-MM) OF 8.5-LB RAW 400-DEG-F-END POINT GASOLINE
GASOLINE MADE IN CRACKING UNITS WITH REACTION CHAMBERS
CHARACTERIZATION GRAVITY OF CRACKING STOCK

Octane Number of Gasoline from Cracking California Residuum.

FIG. 13

tively high sulfur content.

A few crude oils are known in which the sulfur compounds appear to be more stable than are those in California stocks. Crude oil from Bahrein Island (Persian Gulf) and especially that from the Cut Bank Field, Montana, are examples. On cracking residuums from these crude oils, the sulfur appears to concentrate in the cracked residuum, producing cracked naphtha of relatively low sulfur content.

Paraffinicity

California crude oils are substantially less paraffinic than are Pennsylvania, Mid-Continent, East Texas, or West Texas crude oils. Some of the heavy Gulf Coast oils are, however, about equal in paraffnicity to California stocks.

Crude oils range in paraffnicity from certain of the highly aromatic Borneo crude oils, have a characterization gravity of approximately 5 deg. to highly paraffinic crudes, such as certain Pennsylvania, Michigan, and Louisiana stocks, which have a characterization gravity ranging from approximately 36 to 38 deg. California crude oils are grouped about half way between these two extremes, having characterization gravities ranging from 19 to 30 deg. Kettleman Hills, a rather paraffinic California crude oil, has a characterization gravity of approximately 29 deg.; Midway, a rather non-paraffinic California oil, has a characterization gravity of approximately 22 deg. Average southern California stocks are intermediate— characterization gravity ranging from 24 to 26 deg. Mid-Continent and East Texas crude oils range in characterization gravity from approximately 30 to 33 deg., and Pennsylvania from about 34 to 36 deg.

With a few unimportant exceptions, all California oils owe their non-paraffinic character to the presence of naphthenic compounds. Their naphthene conten is considerably higher than that of eastern oils; their aromatic content is low, and is not greatly different from that of eastern oils. Certain Borneo crude oils are far more aromatic in character than are any California oils.

As shown in Fig 9 and 10, the paraffinicity of California crude oils may vary considerably, depending upon the boiling range. For example, gasoline from Santa Maria Valley crude oil is quite paraffinic; whereas heavy gas oil and asphalt therefrom are quite naphthenic.

The naphthenic character of California crude oils is reflected in the high octane number of the straight-run gasolines. The gasolines with an end point of 390 deg. F. at the 20-per-cent point, usually range in octane number from 60 to 73 CFR motor method. A large proportion of them is in the upper part of this range. Corresponding gasolines from the Mid-Continent, East Texas, and West Texas are usually of about 50 to 60 octane number.

The naphthenic character of California stocks also results in production of cracked and reformed gasoline of relatively high octane number.

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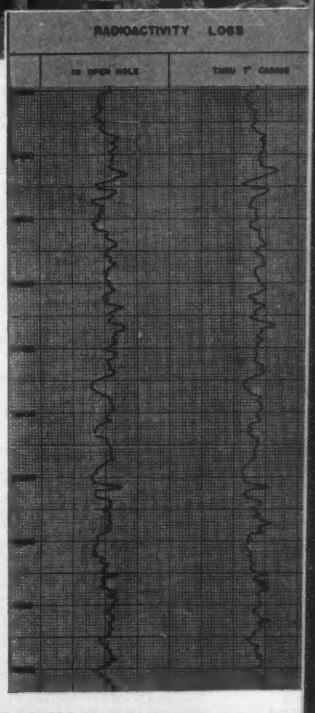

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Minor Components

The wax content of California crude oils varies greatly. The naphthenic crudes, especially those of low API gravity, are usually low in wax and of low pour point. Residuums therefrom are usually of a pour point below about +10 deg. F. The light, paraffinic California crude oils usually contain 2 to 4 per cent wax, residuums therefrom usually being of a pour point above +60 deg. F. The wax is concentrated in the heavy-gas-oil and lubricating-oil distillate range. The asphalt from these crude oils is waxy, but less waxy than is the heavy gas oil.

Naphthenic acids are present in California crude oils throughout the boiling range from kerosine to asphalt. A considerable volume of naphthenic acid is recovered from the different distillates for special chemical manufacture.

Cracked naphtha from California charging stocks contains a considerable amount of nitrogen bases and phenolic compounds. Nitrogen bases can be recovered from the sulfuric acid used in finishing cracked naphthas. A substantial volume of heavy substituted phenols is recovered by caustic-washing the cracked naphthas, neutralizing, and distilling.

Refining Characteristics

California oils are of higher sulfur content, and are more naphthenic, darker in color, and less color stable, than most eastern oils. These factors lead to important differences in the refining processes required.

Straight-run Products

Most straight-run gasolines from California crude oils are treated with a small amount of acid to meet color requirements, and in many cases to lower the sulfur content and to meet the doctor test.

Most of the raw kerosine distillates are of unsatisfactory burning quality due to their sulfur and aromatic content. High-quality kerosine can be, and is, made by sulfur-dioxide treatment, followed by acid treatment to meet color and sulfur requirements. The top cut from the sulfur-dioxide extract is a valuable source of low-aniline-point thinners.

Raw lubricating-oil distillate from all California crude oils is of low viscosity index. The waxy crude oil yields the best distillates in this regard, but even they seldom exceed +30 viscosity index after dewaxing. In a few cases acid treating and dewaxing will produce lubricating oil of better than 90 viscosity index. Most of the high-quality motor oils manufactured in California are produced by solvent treatment and dewaxing of waxy crude oils. The resulting product is of the highest quality.

A large volume of heavy fuel oil, composed of cracked residuum and crude residuum, is produced in California refineries. This stock is of low API gravity, high viscosity, high sulfur content, and may be of high pour point. Blending with 10 to 20 per cent of light gas oil is necessary to meet viscosity and gravity requirements. Viscosity and gravity are substantially less critical in refineries processing crude oils produced east of the Rockies, residuums from most of which are substantially lighter both in gravity and viscosity.

Reforming

Straight-run gasolines from California crude oils respond readily to thermal reforming. Table 3 shows results of reforming straight-run naphtha from different typical California and eastern crude oils.

The fundamental yield-octane-number relationship is believed to be the same for both California and eastern stocks; however, the California oils produce reformed gasoline of markedly higher knock rating, because the charging stocks are of higher octane number than are those from most eastern crude oils.

Raw reformed gasoline from California oils is usually of lower color than is that made from most eastern oils. In most cases treatment is required to meet color and color-stability requirements.

Cracking

Residuum, rather than gas oil, is charged to most cracking units processing California oil. Gas-oil cracking is usually uneconomical, because the required vacuum-distillation and asphalt-viscosity-breaking steps are unduly expensive

The residuum cracking stocks range in Saybolt-Universal viscosity from about 125 to 2,500 sec. at 130 deg. F., averaging 800 sec. The viscosity has been found to be the most satisfactory measure of the yield of gasoline or naphtha that can be obtained from the cracking stock. Fig. 11 shows a viscosity-yield chart for cracking California residuum in single-coil units, with reaction chambers of moderate size.

Gravity is not a satisfactory measure of the yields obtainable in cracking California residuums because of the wide range in paraffinicity and asphalt content of the stocks. However, all California residuums of a given viscosity produce essentially the same naphtha yield for a given cracked-residuum viscosity, whatever their gravity may be. A yield chart such as that shown in Fig. 11 is, therefore, of marked utility in plant operation and in planning the refinery viscosity balance. Viscosity balance is an important problem in California refineries, due to the high viscosity of most of the oils processed.

The charging stocks and cracked residuums are substantially heavier and contain more asphalt than is the case when processing most eastern oils. The cracking process occurs more in the liquid phase than is the case in the East, and coking is substantially more severe.

Fig. 12 shows the relation between sulfur content of charging stock and cracked naphtha when processing California residuums. A large proportion of the charging stock processed in California has a sulfur content of approximately 1.5 per cent, and produces cracked naphtha with a sulfur content of about 0.8 per cent. Most of the cracked naphtha is acid-treated to reduce the sulfur content of the gasoline to a satisfactory value, and to produce good color.

Sulfur presents a far more serious problem in cracking California oils than is the case in the East. This is due in part to the high sulfur content of California oils as compared to eastern oils, and in part to the fact that most eastern cracking stocks produce cracked gasoline of far lower sulfur content than do California charging stocks of the same sulfur content.

Most California cracking stocks produce cracked gasoline of substantially higher octane number than do cracking stocks from crude oils produced in the rest of the United States. This is due to the highly naphthenic character of the stocks. Fig. 13 shows the relationship between characterization gravity of the charging stock and octane number of the raw cracked gasoline produced therefrom, in single-coil units equipped with reaction chambers of moderate size and fractionating columns operating at essentially the same pressure as exists in the cracking zone. As shown in Fig. 13, cracking stock from Midway crude oil (characterization gravity, 22 deg.) produces raw gasoline of about 74 octane number, CFR motor method; whereas, a Mid-Continent crude oil, with a characterization gravity of approximately 32 deg., would produce gasoline of about 67 octane number.

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(Continued from Page 8)

property West American Oil Co. brought in Ashton No. 9 pumping 120 bbls. of 22 gravity crude from perforated intervals between 4210 and 4378 ft. On the ocean front, Southwest Exploration Co. completed No. 44 under the state owned tideland pumping approximately 500 bbls. a day.

Satisfied with the 70 bbl. yield of his Marfar Oil Co. Greer No. 1, John H. Marion is preparing to drill Fee No. 1 one location to the south. Both are in the Five Points area.

Standard Active At West Coyote

With bottom at 4240 ft. and the liner cemented through perforations at 3902 ft., Standard Oil Co. is completing Murphy Coyote No. 127 at West Coyote. When last reported, pumping equipment was being installed. On the same property, Standard is drilling No. 128 below 3450 ft. after cementing casing at 3200 ft. Foundations are completed for Murphy Coyote No. 129.

Oak Canyon Outpost Planned by West Gulf

With two wells producing the deep Oak Canyon zone and another, Lechler No. 3, on the way down, Western Gulf Oil Co. is planning to step to the east and drill Gilmour No. 1 in sec. 32, 5n-17w. Present wells are all located in sec. 31.

Barnsdall Completing Rancho San Francisco 28

Barnsdall Oil Co. is completing Rancho San Francisco No. 28 at Newhall-Potrero after bottoming at 7657 ft. and cementing 7 in. casing at 7390 ft. The top of the third zone was logged at 7408 ft. No. 26, west edge well, is standing idle after tests of several intervals between the casing shoe at 7468 ft. and bottom at 7832 ft. recovered only non-commercial quantities of oil.

St. Anthony Finishes Wilmington Outpost

Producing both the Ranger and Terminal zones, St. Anthony Oil Co. recently brought in its McComb No. 1 at a rate in excess of 200 bbls. a day of 16.6 gravity oil cutting 20 per cent. Located at the southeast corner of State St. and Ravena, the hole was bottomed at 3710 ft.

One of the largest Ranger Zone wells yet to be completed was Union Pacific Railroad's U. P. No. 210 on Terminal Island which initialled 2124 bbls. of 24 gravity crude with a 0.1 per cent cut. The hole was bottomed at 2715 ft. and finished with a 4-in. liner conventionally gravel packed.

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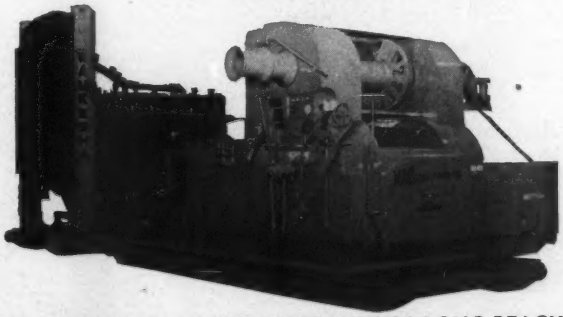

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San Joaquin Valley

Paloma Form. Test Recovers Saltwater

Western Gulf Oil Co.'s Symons No. 12-7, one mile east of production in sec. 7,32-27, recovered only a large volume of gassy water testing 990 grains per gallon on a five hour test from the shoe to bottom. Operators are now attempting to determine the point of entry.

Bottomed at 11,700 ft. after coring good looking oil sands from 11,275 to 11,547 ft., the well was cased with a string of 7 inch at 11,265 ft. After testing wet on the initial cement job, the shoe was twice squeezed through perforations at 11,215 ft. After recementing with 25 sacks, the shut off tested OK and the formation tester was run in to try the sands.

The water recovery is a puzzler, for the sands, while reported to be fine grained and gassy, were expected to produce the large volumes of gas and condensate recovered in the main portion of the field.

Western Gulf has suspended work on the L.A.A.C. No. 16-6 pending the outcome of the current outpost. This proposed try, for which rig has been built, is located on lands of the Los Angeles Athletic Club in sec. 6,32-27 north of the extension driller.

General Petroleum is excavating the site for its northerly outpost, Gallagher No. 61-33, in sec. 33,31-26.

In the westerly portion of the field, Ohio Oil Co. spudded KCL No. A-10,41-4 near the north quarter corner of sec. 4,32-26, and was last reported drilling at 1220 ft.

Amerada Makes Second Fresno County Strike

Two discoveries within a 60-day period is a better than fair batting average for any operator, and Amerada Petroleum Corp., who accomplished this feat in Fresno county, is to be congratulated.

The companys latest discovery was in Lawton No. 45-26, located in sec. 26,17-19 of the Riverdale area. Bottomed in Eocene siltstone at 8311 ft. the well encountered the Temblor at 5615 ft., the Kreyenhagen at 7610 ft. and the Eocene at 7900 ft. With 5½ in. casing cemented at 8116 ft. the well was unsuccessfully tested uphole at intervals from bottom to the present productive level gun perforated from 6665 to 6685 ft. with 20 holes.

With 2 in. tubing landed on a packer at 6625 ft. and with a control sleeve at 6615 ft. the try was completed flowing 558 bbls. of 34 gravity clean oil through a small orifice. Tubing pressure registered 1025 lbs. and 1,375,000 cu. ft. of gas was measured in the period, giving a 2500 gas-oil ratio. Last production figures before being shut in under 1550 lbs. were 273 bbls. cutting 6.0% through a 12/64 in. bean under 1150 lbs. and accompanied by 350,000 cu. ft. of gas.

The company is preparing to move to Jensen No. 54-26, a northwesterly offset location in the same section.

SAN JOAQUIN VALLEY WILDCATS

Area	Well	No.	Section	Depth	Status
	Fresno County				
Helm	Amerada Pet. Co., Weyant	5-27	27, 16-17	6584	Drilling
	General Pet. Corp., Esperoad	75-33	33, 16-17	970	Drilling
Jacalitos Hills	Wilshire Annex Oil Co.	21-26E	26, 3-15	3463	Drilling
Kerman	Richfield Oil Corp., Ponte	1	30, 13-17		Location
Raisin City	Barnsdall Oil Co., Ripperdan	1	24, 15-17	5161	Testing
	Seaboard-T.W.A.-Union, S.T.U.	66-13	13, 15-17	5975	Drilling
	Shell Oil Co., Inc., Prop., Inc.	7-18	18, 15-18	5150	Testing
Riverdale	Amerada Pet. Corp., Jensen	54-26	26, 17-19		Grade
	Amerada Pet. Corp., Lawton	45-26	26, 17-19	8311	Producing
	Kern County				
Arvin	Pacific Western, Geo. F. Getty, Inc., Houchin	1	27, 31-29	5671	Drilling
Belridge—South	Ivy Drilling Co., Parkford	1	12, 29-21	1140	Idle
	Sentinel Oil Co.	1	10, 28-20	3902	Idle
Buttonwillow	The Texas Co., Bowerbank	4-23	23, 29-24	12144	Prep. to test
Devils Den	Morton. H. C., Well	2	30, 26-19		Rigging up
Edison	Getty, J. Paul, Portals Corp.	1	5, 30-29	4255	Drilling
	Frazier, Finley & Assoc., Portals Corp.	1	4, 30-29		Rig
McClung	Macrate, A. N., Haberfelde	1	32, 29-26	12035	Fishing, D.P.
Mt. Poso	Alpha Oil Co., C. V. Elliott	1	1, 27-28	1027	Idle
Paloma	General Pet. Corp., Gallagher	61-33	33, 31-26		Grading
	Ohio Oil Co., KCL A-10	41-4	4, 32-26	220	Drilling
	Western Gulf Oil Co., L.A.A.C.	16-6	6, 32-27		Rig
	Western Gulf Oil Co., Symons	12-7	7, 32-27	11700	Testing
Richgrove	Bolling, R. S., Quinn	3	15, 25-27	2926	Testing
	Shell Oil Co. Smith Cairns	3	11, 26-27		Foundation
Round Mt.	F.H.R. Oil Co., Well	1	2, 28-28		Rigging up
Shafter	Continental Oil Co., Neumann	1	36, 27-24	6442	Drilling
	General Pet. Corp., S.P.	51-15	15, 28-24	13159	Drilling
Shale Hills	The Texas Co., Anderson, Inc.	1	19, 28-20	5777	Abandoned
	Tideland Oil Co., Grant Est.	1	4, 27-18	1756	Idle
Union Avenue	Hancock Oil Co., Roberts	4	6, 30-28	4266	Drilling
	Richfield Oil Corp., Union Ave.	2	6, 30-28	4417	Drilling
	Kings County				
Kettleman Hills	Mid-Kettleman Co., Bunting	1	25, 23-18	9138	Idle
Pyramid Hills	Pacific O. & G. Dev. Corp., West Slope	2	20, 24-18		Location
	Pacific O. & G. Dev. Corp., West Slope	41	20, 24-18	2087	Completing
	Tulare County				
Kingsburg	Goble, W. E., Goble	1	28, 16-23	1735	Drilling
Terra Bella	Stout, Geo. W., Stout	2	11, 23-27	745	Idle
Tipton	Richfield Oil Corp., Hewitt	1	1, 21-25	417	Drilling
Trico	Trico Oil & Gas Co., Lee	1	17, 24-23		Rig

Amerada's earlier strike was Clover No. 31-34, finished late in October in the Helm area of Fresno county. The well was finished utilizing only a thin zone at 7300 ft. flowing nearly 14,000,000 ft. of gas and 662 bbls. of 64 gravity condensate. This well proved producible on formation tests in two sections of the Miocene and in one horizon of the Eocene.

Amerada is presently drilling Weyant No. 5-27 at 6584 ft. in sec. 27,16-17 as the second try of this newly discovered field. General Petroleum Corp. is seeking extension to the field by drilling Esperoad No. 75-33 in sec. 33,16-17 near 1000 ft.

Barnsdall Testing Raisin City Outpost

At the southerly flank of present Raisin City production Barnsdall Oil Co. is preparing to make an open hole formation test following failure to complete Ripperdan No. 71-24 with a liner in the hole.

Located in sec. 24,15-17, the well was bottomed at 5161 where a formation test of the inerval 5124 to 5140 ft. recovered oil and salt water. Plugged to 5057 ft., a 17 minute test showed a good gas blow with fluid recovery consisting of gassy, oily mud and sand while more than 2880 ft. of oil was blown free.

With 7 in. casing cemented at 5049 ft. and 5 in. liner containing 5 ft. of perforations landed on the plug, the well was swabbed nearly dry, recovering fresh water, oil and mud.

At the last report the liner had been pulled, the hole scraped and preparations instituted to try the hole barefoot.

In the sec. 18,15-18 in the main portion of the new field Shell Oil Co. is cleaning out Properties, Inc. No. 7-18 after formation tests from 5015 to 5071 ft. and 5140 ft. to bottom at 5150 ft. recovered gassy mud, salt water and a little oil. The gas sand which provides the field with its wallop was cored from 4991 to 5002 ft.

Across the section line in sec. 13,-15-17, Seaboard Oil Corp., Tide Water Associated and Union Oil Co.s are running electric log to bottom at 5975 ft. in S.T.U. No. 66-13. Cores in this well placed the Kreyenhagen at 5957 ft. after finding the "88" sand at 5140 ft. and the Ash bed at 5375 ft.

New Operator Starts Round Mountain Well

Frank J. Heyd, operating under the name of F.H.R. Oil Co. is rigging up to drill well No. 1 in the southeast quarter of sec. 2, 28-28 of the Round Mountain area. The try is located in potential oil producing territory between the Mount Poso and Round Mountain fields.

Bolling Testing Richgrove Sands

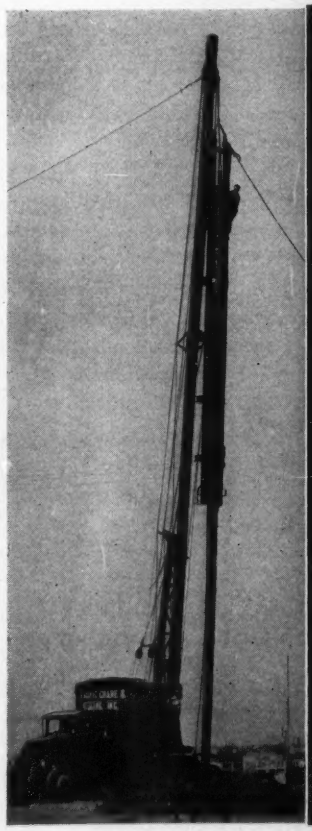
R. S. Bolling is preparing to run gravel packed liner and test Quinn No. 3 on holdings in sec. 15,25-27 of the Richgrove-Jasmine area. Bottomed in gray sand after coring heavy oil sand in the interval 2896 to 2920 ft. and with 7 inch casing cemented at 2887 ft., the well will try for production in the Walker sands. The Vedder, or normal objective of prior wells, was found barren from 2580 to 2590 ft.

Texaco To Re-Test Valley Deep Well

Nearly ten miles west of the Greeley field in sec. 23,29-24 The Texas Co. is grading roads to reenter the 12,144 ft. Bowerbank No. 4-23 which was abandoned by Union Oil Co. in February of 1940.

Drilled as a test for deep Valley oil sands the well was never tried in the shallow gas zones often found in the general area but which to date have not proved commercial. Such tests are the scheduled program for the hole.

In the original drilling the well found the Stevens zone at 10,776 ft. and after gun perforating 5½ in.



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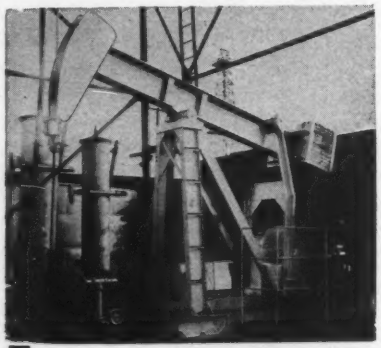
casing, cemented at 11,662 ft., from 10,776 to 10,842 ft. recovered a little wet oil on production trial. The sands below this horizon, of which many streaks were found, were largely fine grained, tight and grayish.

Wilshire Drilling 2nd Jacalitos Well

Wilshire Annex Oil Co. is following its recent Jacalitos Hills area discovery with a second well called No. 21-26E. Located in sec. 26,21-15 the well was last reported drilling at 3463 ft. This area is located south of Coalinga and due west of the north tip of the Kettleman North Dome field.



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H. C. Morton Rigging Devils Den Driller

H. C. Morton is rigging portable rotary equipment to spud well No. 2 in sec. 30,26-19, a little more than a half mile northeast of his Corehole No. 1 which was completed in November pumping 50 bbls. of 13.5 gravity clean oil from plugged depth of 1000 ft. When last reported the well was pumping 12 bbls. per day cutting 5.0%. Generally referred to as Devil's Den, the area is more specifically the Blackwells Corner area, named from the cross roads store located near the scene of drilling.

Interest Revived In Edison Area

J. Paul Getty's reported oil sands in Portals Corp. No. 1, a half mile south of the small pool of production in sec. 5,30-29, is prompting new interest in the area lying north of the main Edison field.

The Getty well is bottomed in oil sand at 4255 ft. after entering the zone at 4210 ft. The well is reported to have encountered the first oil showings at 2885 ft. and to have found Carbonaceous Silt at 3025 ft. When last reported operators were running 7 in. casing to cement over the main oil zone.

East of here, near the west quarter corner of the adjacent section 4, Frazier, Finley & Associates have built rig to drill Portals Corp. No. 1.

Old Coalinga Producer Makes Good Recompletion

Evidence that the old Coalinga oil field is not yet washed up was presented when Shell Oil Co. deepened and recompleted No. 8-29 in the southeast corner of sec. 29,19-15.

Originally bottomed at 2659 ft. the well was deepened to 2800 ft. where 5½ in. liner perforated from 2661 to 2709 and 2727 to 2741 ft. was landed. Recompleted on the pump the well is making 311 bbls. of 17.5 gravity oil cutting only 1.9%.

In sec. 14,20-14 C.M.S. Kipling's Thompson No. 3 is drilling at 255 ft. and Westates Petroleum Corp.'s No. 1 is bailing after landing liner containing 100 ft. of perforation on bottom at 299 ft. Z. L. Phelps well No. 1, in sec. 20,19-15, is drilling at 1790 ft.

Shafter Wildcat Sets Protection String

General Petroleum Corp.'s deep wildcat, S. P. No. 51-15, in the Shafter area is standing with a 6-5/8 in. protection string cemented at 13,123 ft. Located in sec. 15,28-24, the well is exploring to depth in an area roughly adjacent to other deep Valley fields. Presently bottomed at 13,159 ft. the well encountered the Olcese near 11,850 ft.

Continental Oil Co. is drilling its Neumann No. 1, sec. 26,27-24, at 6442 ft. This well seeks to duplicate or better the production which the company recently effected in section 35.

Kings Co. Pumper Re-Completing

In the Pyramid Hills area, Pacific Oil & Gas Development Corp. is recompleting West Slope No. 41 which it acquired from its driller, Tide Water Associated Oil Co.

Located in sec. 20,24-18, the well was drilled to 2087 ft. as a core hole trial encountering promising looking Temblor sands below 850 ft. Plugged to 950 ft. the hole was reamed to full size and completed pumping 20 bbls. daily.

The new operators cleaned out the hole from the shoe of the 6-5/8 in. at 835 ft. to the plug and landed 4½ in. liner containing 108 ft. of perforations at 946 ft. On pumping trial the well made 25 bbls. of clean oil with a little sand. At press time the pump was being re-run after bailing the hole free of sand.

Coastal District

Field, McDuffie, et al Start Coast Wildcat

O. C. Field, Wm. C. McDuffie, et al, are preparing to drill a wildcat well on Palmer Stendel Oil Corp. property north of the old Cat Canyon fields in Santa Barbara county. Preliminary work is already under way on the well site which is 330 ft. south and 990 ft. east of the west quarter corner of sec. 13,9n-33w.

The location for the new exploratory well is about a mile northwest of the O. C. Field Gasoline Co. Palmer Stendel No. 24-1 which was drilled during July of this year to 3363 ft. Like the former well, the present test will seek production in the Monterey similar to that in the new deep area west of the old West Cat Canyon field where Standard and Union Oil Companies are obtaining 1000 bbl. production from the Chert Zone at approximately 6100 ft. The No. 24-1, however, failed to find the chert and was abandoned in volcanic ash after topping Miocene at 2690 ft.

Wildcat Will Test Santa Susana Area

Robertson & Melton, a recently formed partnership, are preparing to drill a wildcat well in the Santa Susana area of Ventura county. The preliminary location places the test in sec. 14,2n-18w, about three miles southeast of Simi.

Royalty Service Co. Drills Careaga Well

The Royalty Service Co. Careaga wildcat, located in sec. 8,8n-33w, two and a half miles southwest of the Los Flores play, was last reported drilling in Sisquoc at 3650 ft. The well is in the same section with the E. C. Arnold and Douglas-Stratton Oil Co. tests which obtained a little oil in the Monterey in 1938 and 1939 at depths between 5000 and 6000 ft. but were not considered commercial. The latter project was later carried to 7238 ft. bottoming in Miocene brown shale and was last tested between 6450 and 7194 ft. where it pumped approximately 35 bbls. daily of 28 gravity oil cutting 50%. The Royalty Service project is located 2500 ft. northeasterly from the old wells in what is considered a higher structural position and the operators hope to find light oil in paying quantities at a slightly shallower depth. Top of the Miocene is expected above the 5000 ft level.

O. C. Field Tests New Casmalia Well

With bottom plugged from 2195 ft. and 11¾ in. casing cemented at 1622 ft., O. C. Field Gasoline Corp. ran a perforated liner and is testing Righetti No. 2 in the Casmalia field.

The first new well for the area in some years, Righetti No. 2 comes close to being a wildcat though located in proven territory. Most of the surrounding wells were drilled years ago, before the development of electric logging and other modern engineering techniques, so accurate correlations with the old holes are extremely difficult according to W. W. Porter II, who handles subsurface work for the Field organization. Monterey was topped at 938 ft. and a cherty section similar to the Chert Zone of other Santa Maria fields was encountered at 1620 ft.

Texaco Abandons No. Calif. "Cat"

The Texas Co.'s Carter No. 1, located in sec. 3,17s-12e of the Ciervo area in San Benito county, was abandoned without showings in barren Cretaceous at 3265 ft.

COASTAL COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
Santa Barbara County					
Cat Canyon	Alphonzo E. Bell Corp., Gilmore	1	23, 9-33	6298	Swabbing
	O. C. Field & Wm. C. McDuffie, et. al., Palmer-Stendel	13–1	13, 9-33		Grading
Careaga	Royalty Service Corp., Careaga	1	8, 8-33	3550	Drilling
Casmalia	Dolly Adams Oil Co., Marganti	2	13, 9-35		Location
	O. C. Field Gas. Corp., Righetti	2	13, 9-35	2195	Completed
Lompoc	Alphonzo E. Bell Corp., Lompoc	6	28, 8-34		Grade
Santa Maria	John W. Lee, Trustee, T.G.	1	33, 10-33	2257	Drilling
Ventura County					
Bardsdale	Hopland Oil Co., Well	1	1, 3-19	4634	Idle
	Ventura Southern Oil Co.	G–1	19, 3-19	660	Idle
Conejo	Sycamore Oil Co., Boylan	1	23, 1-20	1700	Idle
Ojai	Kelalee Pet. Co., Harvey	1	8, 4-21		Rig
	Richfield Oil Corp., Ojai	44	13, 4-22		Rigging up
Piru	Pacific Western Oil Co., Temescal	11	4, 4-18		Grading
Santa Paula	Shell Oil Co., Inc., S.P.Y.S.	1	21, 3-21	4219	Drilling
Santa Susana	Robertson & Melton, Runkle	1	14, 2-18		Material
Sespe	Alford, J. A., Trustee, Goodenough	1	18, 4-19	320	Drilling
	Ivers, H. A., Kentuck	13½	1, 4-20	865	Cleaning out
South Mountain	Comstock Pet. Co.	1	17, 3-29	2250	Idle
	Loose, E. H. & Dietzmann, J.	1	17, 3-20	4200	Idle
Timber Canyon	Denison, A. T., Denison	1	13, 4-21	425	Drilling
	Crude Oils., Inc., West	1	19, 4-20	927	Prep. to resume
	Henderson-Ortez Oil Co., O'Leary	1	29, 4-20		Rig

NORTHERN COUNTIES WILDCATS

County	Well	No.	Section	Depth	Status
Colusa	Pacific National Pet. Corp.	1	17, 17n-4w		Rig
Madera	Blake, T. E.	2	22, 10s-17e		Rig
Mendocino	Keyt, N. F.	1	3, 12n-17w	1740	Idle
Monterey	Loma Grande Oil Co., Corey	1	23, 24s-10e	3820	Idle
San Benito	The Texas Co., Carter	1	3, 17s-12e	3265	Abandoned
San Joaquin	Westates Pet. Corp., Spence	1	22, 1s-7e		Location
	Standard Oil Co., West Coast Life	2	4, 1n-5e		Location
Sutter	Buttes Oilfields, Inc.	7	3, 15n-1e	2700	No report
Yuba	Wright, L. G., Cox	1	18, 14n-5e	1805	Fishing D.P.

THIS LAUGH

OFF!!

A gentleman slipped on the stair of a subway and started to slide down to the bottom. Half-way down he collided with a lady, knocking her down, and the two continued their way together.

After they had reached the bottom, the lady, still dazed, continued to sit on the gentleman's chest. Looking up at her he said politely:

"I'm sorry, madam, but this is as far as I go."

It happened "somewhere" in India. The post commandant had made enquiries about one Gunga Djin, a native soldier who had taken strongly to British ways and who was particularly fitted for a mission the commandant had in mind. The commandant was informed that Gunga Djin had been given a week's leave and was already overdue back at the post by several days. The next day the commandant was handed a letter which had been received from the missing native soldier. This is what the commandant read:

"Most Noble Born Sahib Soldier:

"Your servant is most sad as well as desolate that he is still here instead of there, but there is most good reason for his lack of punctuousness. It is that I am here just two days when my wife run away with man and all my cows and chickens and children. When I discover where I can find them I am unfortunately able to do same at time when I am outnumbered by former wife's relatives. When I come out of hospital I find that my home has been burned and I am without everything. By God, I'm annoyed."

E. A. Bender tells this one:

"Did my father leave an order with you this morning for a load of wood?" asked a strange, but attractive young lady of a well-known planer mill man.

"I don't know, miss," he replied. "There was a gentleman in who said to deliver a load to a driver who would call and said it was Mr. Zell."

"Yes, thank you," she said. "I'm Gladys Zell."

"What?" gulped the man.

"I'm Gladys Zell," she replied.

"Oh, yes, of course," he replied. "So am I."

A young lady was on a sightseeing tour in Detroit. Going out Jefferson Avenue the driver of the bus called out places of interest.

"On the right," he announced, "we have the Dodge home."

"John Dodge?" the young lady asked.

"No. Horace Dodge."

"On the right we have the Ford home."

"Henry Ford?"

"No, Edsel Ford."

"On the left we have Christ church."

A fellow passenger hearing no response from the young woman, tapped her on the shoulder and said: "Go ahead, lady, you can't be wrong all the time."

A hypochondriac consulted a doctor for a thorough checkup. After going over the patient carefully, the doctor inquired of him as follows:

"Do you drink?" Reply was "No, doctor."

"Do you run around nights?" Reply was "No, doctor."

"Do you swear excitedly?" Reply was "No, doctor." Thereupon the doctor inquired if he felt pain on each side of the head.

"Yes, doctor, I do," was the patient's reply.

"Well, my man, your trouble is your halo is too tight," concluded the doctor.

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MARTIN-DECKER CORP., LONG BEACH, CALIF.

"DOC" HAYES TO DEFEND TITLES AS NINETEENERS START NEW CHAMP MATCHES

The Nineteeners—that group of intrepid golfers composed of local oil men—started its new series of championship golf matches recently at Annandale Country Club, with A. S. "Doc" Hayes of Bell & Loffland, defending his championship crown.

"The Great Doctor" became top flight golfer of the Nineteeners (for the time being, anyway) by defeating Axelson's well known little Alvin "Dutch" Zwerneman one up in the finals at Virginia Country Club. The match was a thriller from start to finish. It was anybody's game until the last putt on the eighteenth green when "Doc" managed to win by a one-hole margin. Before the contest reached the last two-some, Hayes in Handicap play, had eked out victory one by one over such famous divot-diggers as J. V. MacDonald J. L. O'Leary (bye), Monte Lindmoe, R. L. Lohman and J. L Martin.

Golf Tournament at Rancho Santa Fe

In tournament matches at Rancho Santa Fe, where the Nineteeners sojourned over a recent week-end, Bill Cline carried off first prize in the Calcutta pool which also carried prizes for runners-up "Twinkle Toes" Percy Hayes and Lev Sacre.

Joe Aderhold led the tournament for the first day, with Lev Sacre and Bill Martin hot on his heels. But even Joe's rigorous training failed to pay out. He not only took his golf so seriously that he went to bed early every night, but he even shunned the spotted deck—something very unusual for Joe. All to no avail, for Joe—along with Bill Beck, Holly Hayter, Dick Townley and other favorites encountered trouble somewhere along the line and bowed out to Lev Sacre and the others. Incidentally, Lev had just gone to work for Joe, so the boys are wondering what the outcome of that little upset will be.

The tournament was also occasion for a grand stag party at Rancho Santa Fe Inn, in which nearly the whole roster of members turned up to enjoy their usual games with the pasteboards and take part in other festivities. The highlight of the evening was the parade of the group led by "Big Shot" MacDonald and the merry music of charming Betty Gordon of Hollywood, who entertained throughout the evening on her accordion, and acted as accompanist for the lustrous singing of the members.

During the dinner hour, "King Tutt" Tuttle teamed up with Miss Gordon in a violin-accordion duet and parodies were sung by Ward Blodget and Monte Lindmoe. Charlie Perkins and Ken Norris entertained with amusing yarns and telegrams were read from some of the members unable to be present.

The next big event of the Nineteeners is their 100th tournament, which is now being planned for January 15 at Riviera Country Club.

Lyle E. Kesselman Heads Fluid Packed Advertising

Lyle E. Kesselman, for the past six years Fluid Packed Pump Co.'s field representative in the Los Angeles Basin District, has been advanced to the post of advertising manager and head of the Foreign Sales Department, according to

Lyle E. Kesselman

an announcement by company officials.

Mr. Kesselman is widely known among California oil men. He first came to California late in 1920 to establish a branch plant for Kesselman and Co. of Butler, Penn. and Parkersburg, W. Va. —an oil concern which has served the industry ever since 1875. Following the Santa Fe Springs activity in 1925, Mr. Kesselman entered the drilling and production phases of the oil business and has continued active in all lines ever since. In addition to drilling his own wells, he gained wide experience in other firms, as engineer, toolpusher and drilling and production superintendent in both California and Texas. His well-rounded oil career also includes some two years each in the technical and manufacturing departments of Shell and Associated. Mr. Kesselman is author of a number of technical reports and articles dealing with production practices and development operations, some of which are currently appearing in oil journals. When not using up his "hobby time" writing and arranging production reports and surveys. Mr. Kesselman manages to get in a little fishing on the side. He is also a football enthusiast, and lives right next to the football stadium in Lakewood Village where the game broadcasts come in just fine right in his own living room.

Martin-Decker Canadian Service

J. E. "Johnny" Miller of the Service Engineering Co., Okotoks, Canada, has been appointed Canadian representative for the complete line of Martin-Decker Drilling Control Instruments, according to an announcement by Martin-Decker Corp. of Long Beach, Calif. Mr. Miller will have charge of sales, installations and maintenance of Martin-Decker equipment used on Canadian wells.

New Valve and Meter Offices on West Coast

Because of expanded activities, Pittsburgh Equitable Meter Company and Merco Nordstrom Valve Company have opened new sales offices in San Francisco and Seattle. This is in line with a plan of increased sales and service facilities for the entire West Coast, according to Captain A. E. Higgins, Vice President. Russ Waters has been appointed Branch Manager of the new San Francisco office, located in the Hobart Building, 582 Market Street. Mr. Waters will be assisted by Fred D. Webster, Richard L. Ford and Gilbert T. Bowman in covering the area of Northern California and Nevada. The new Seattle office located at 119 West Denny Way, will serve the states of Oregon, Washington and Idaho, under the jurisdiction of the San Francisco branch. Frank P. Tangney will be in charge of water meter sales in general in that area and William R. Dominick will cover industrial sales. Hereafter, sales activities in the Bay District will be directed from the San Francisco office instead of from the companies' plant at Oakland. H. Boezinger, Vice President, is in charge of all sales activities for the entire West Coast.

Here and There

James R. "Jim" Russell, long a familiar face in California fields, and Wm. L. Hopkins have formed the Russell & Hopkins Drilling Co. to engage in the contracting business. The new company is prepared to drill to any depth on a turn-key or completed basis. Offices are maintained at 1031 So. Broadway, Los Angeles.

Business and Professional Directory

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Franks portable coring rig. Derrick, drawworks, mud pump, all equipment completely portable, mounted on Ford V-8 Truck. Equipment, tires excellent condition. Box No. 50, care California Oil World. 2/5d

MAPS

Large maps of Los Angeles Basin oil fields and map showing all California oil fields. Price $15.00 each on paper and $20 each on cloth. Individual state oil and gas maps of Mid-Continent and Rocky Mountain regions. Maps show geological cross sections at base. These maps indicate wells drilling, wells producing and abandoned, with depths.
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Phone: TUcker 7530

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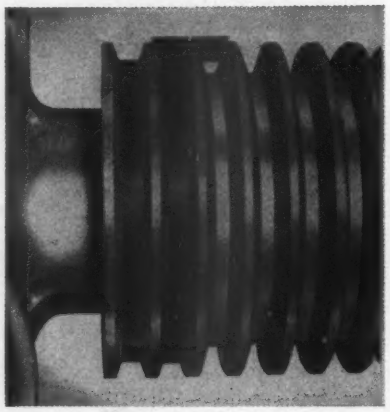
1208 Subway Terminal Bldg.
Los Angeles, California
Phone TUcker 7719

Practical Method Devised To Equalize V-Belt Tension

A V-Belt Rubber Shock Absorber has recently been placed upon the market which, according to the manufacturer, contributes much to the efficiency and durability of V-Belts and pulleys, due to the fact that it supports the belt and forces it to ride the pulley groove in the proper place.

The V-BELT RUBBER SHOCK ABSORBER is moulded of a special high grade rubber, compounded for long life, and is shaped to fit the bottom of the pulley groove, acting as a cushion on which the belt seats.



The photograph above clearly shows the position of the SHOCK ABSORBER in the pulley groove. Approximately 1/16 in. is allowed between the bottom of the belt and the top of the SHOCK ABSORBER. This allows the belt to flex sufficiently so as to grip the walls of the pulley groove, but does not allow the belt to flex so far as to jeopardize the belt structure.

Most belts in operation are subjected to severe shocks several hundred times per minute. With the "V" BELT RUBBER SHOCK ABSORBER applied to the pulley, the manufacturer claims, the belt is relieved of these shocks, with the result that belt, as well as pulley life is extended substantially.

Worn pulleys are a large contributor to cutting short the average belt's life. The "V" BELT RUBBER SHOCK ABSORBER was installed on a number of such pulleys and even in severe cases belt life was increased and very little additional wear on the pulley observed.

Slipping belts are the direct cause of many fires, and this hazard is said to be greatly reduced by installing "V" BELT RUBBER SHOCK ABSORBERS on drive pulleys.

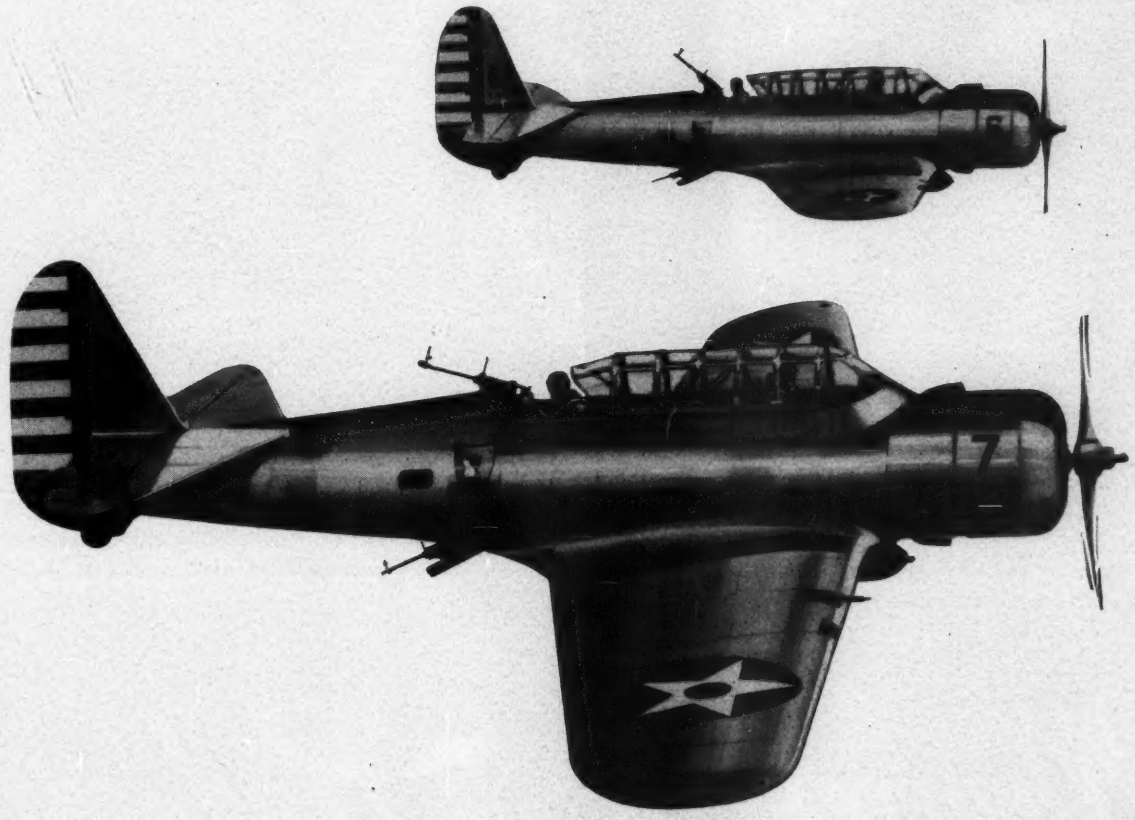
"V" BELT SHOCK ABSORBERS are manufactured in all dimensions for all belt sections. Only a few minutes is required for installation.

Further details and literature may be had by writing Jack Lynn or L. B. (Mac) MacGregor at L & M RUBBER PRODUCTS, INC., 2375 Lewis Avenue, Long Beach, California.

New fast Army gasoline stove designed for use in trucks will boil water at 60 miles an hour, cook beans at 50, and boil 15 gallons of water in half an hour.

FIRST LINE PERFORMANCE

FOR YOUR CAR



You'll get quicker starting, snappier pick-up and quieter power with Associated Aviation Ethyl. It *outperforms* automotive gasolines, both regular and Ethyl, because it is refined to strict aviation specifications. Try Associated Aviation Ethyl in that car of yours *today.*

TIDE WATER ASSOCIATED OIL COMPANY

ASSOCIATED AVIATION ETHYL

Photo by W. A. Oberlin

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. . . the recognized answer to emulsion problems is Tret-O-lite. Its general oil field use for many years has led to the development of varied compounds suitable for treating the different types of crude oil emulsions encountered.

If you have an emulsion problem, it's a job for the Tret-O-lite organization . . . phone or write for your nearest representative or Tret-O-lite office.

Practical Experience

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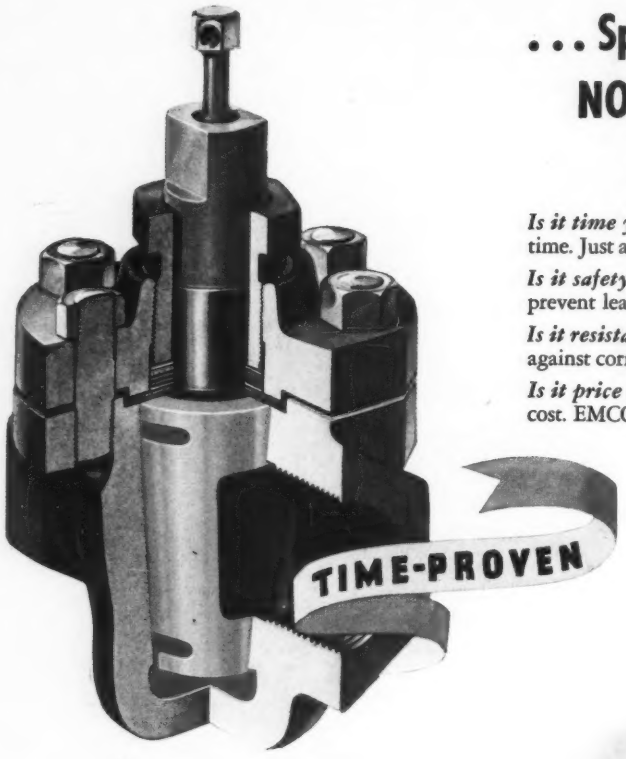
DEMULSIFYING

Over unbeaten paths—for unbeatable valve service

—Nordstroms go far



. . . Speaking of valve costs, NORDSTROMS definitely prove their economy in ANY service

Is it time you want to save? Nordstroms actually ***do*** save operator's time. Just a quarter turn opens or closes a Nordstrom the quickest way.

Is it safety you demand? Nordstroms, with "Sealdport" lubrication, prevent leaks internally and externally. They are sealed against leaks.

Is it resistance you seek? Nordstroms are more completely protected against corrosion and erosion regardless of the temperature.

Is it price that concerns your choice? Nordstroms are consistent in cost. EMCO-Nordstroms, in particular, are competitively priced.

SERVICE COUNTS MOST!

A cheap price tag is not the main consideration in choosing valves. How a valve will perform in ***your*** service is the factor that interests you most. Nordstrom Valves have to be built right in the first place. More skill, more precision, more quality, goes into their production—to assure permanently satisfactory operation.

Nordstroms ***keep upkeep down.***

Progress like this keeps NORDSTROM Valves ahead

In striving to improve the product, Nordstrom engineers are constantly testing new alloys, checking and testing newly devised plastic lubricants, making elaborate chemical and physical tests, etc. Countless ideas in lubricated plug valve design have been considered and discarded by Nordstrom engineers. Out of long research and experimental work in the Nordstrom laboratories have come the most outstanding valve improvements. These include the impervious seal of the Hypreseal type, unique Multiport designs, EMCO-Nordstrom gate valve dimensions, brittle-resistant alloys for sub-zero service, alloys for withstanding corrosion and erosion at high temperatures, remote control applications, metals to withstand the highest pressures, and hot-lapped plugs. Most recently has come the development of Merchrome Coated Valves which adds greatly increased valve life where high temperatures, extreme abrasion and corrosion are prevalent.

A stick of Nordco lubricant inserted at long intervals in a Nordstrom Valve keeps it in prime condition, easy to operate, pressure protected against leaks. Ask for descriptive Bulletin.

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Sealdport Lubrication

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